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THESIS

THE APPLICATION OF MICROCOMPUTER SPREADSHEETS TO PRODUCE THE US ARMY FIVE YEAR FIELD GRADE OFFICER PROMOTION PLAN

by

Howard T. Styron

December 1984

Thesis Advisor: P. R. Milch

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Promotion Zone	DOPMA

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This thesis has two specific objectives. The first is to document and explain the mathematical computations and logic used in the production of the Five Year Field Grade Officer Promotion Plan for the US Army. The second objective is to demonstrate how microcomputers and commercially available state-of-the-art electronic spreadsheet techniques can be used to produce the Five Year Promotion Plan and the flexibility

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The thesis proposes that the advantages of automating the promotion plan production process are significant and persuasive. Microcomputers and commercial software programs are powerful tools which can drastically increase the productivity of force planners and personnel managers at all levels. These tools will reshape the way problems are forecasted, alternatives developed, solutions analyzed, programs implemented and feedback processed to optimize the outcomes.

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The Application of Microcomputer Spreadsheets to Produce the US Army Five Year Field Grade Officer Promotion Plan

by

Howard T. Styron
Captain, United States Army
B.S., United States Military Academy, 1975

Submitted in partial fulfillment of the
requirements for the degree of

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from the

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December 1984

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This thesis has two specific objectives. The first is to document and explain the mathematical computations and logic used in the production of the Five Year Field Grade Officer Promotion Plan for the US Army. The second objective is to demonstrate how microcomputers and commercially available state-of-the-art electronic spreadsheet techniques can be used to produce the Five Year Promotion Plan and the flexibility this technique provides the force planner and personnel manager.

The thesis proposes that the advantages of automating the promotion plan production process are significant and persuasive. Microcomputers and commercial software programs are powerful tools which can drastically increase the productivity of force planners and personnel managers at all levels. These tools will reshape the way problems are forecasted, alternatives developed, solutions analyzed, programs implemented and feedback processed to optimize the outcomes.

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I. INTRODUCTION

This thesis documents the application of microcomputers and commercially available software programs to force planning and personnel managements problems. The thesis uses the Five Year Field Grade Officer Promotion Plan to demonstrate the usefulness of electronic spreadsheet techniques provided in LOTUS 1-2-3, an over-the-counter software product. The microcomputer and electronic spreadsheet technique produces the Five Year Promotion Plan quickly and easily. It also serves as an effective tool in answering "What if?" questions relating to senior officer promotions.

There are two specific objectives of this thesis The first is to explain the mathematical computations and logic used in the production of the Five Year Promotion Plan. The second objective is to demonstrate how LOTUS 1-2-3 can be used to produce the Five Year Field Grade Officer Promotion Plan and the flexibility this technique provides the force planner and personnel manager.

Today's US Army commissioned officer corps numbers nearly 80,000. Management of these 80,000 individuals is a complex and difficult task. Personnel policy decisions made today will dramatically effect the size and nature of the officer corps in the future. The Army's Five Year Field Grade Officer Promotion Plan is one of the force management mechanisms which help monitor the dynamics of the complex system. The degree of complexity has grown tremendously over the past decade and no change in this trend is foreseen. Force planning is complicated because of the many variables which must be considered in developing policy and programs for the officer corps. At the heart of all policies and programs is the goal of meeting the Army's officer

manpower requirements now and in the future. These requirements come in two equally important dimensions, rank and skill. First, the requirement for specific numbers of officers in each rank or grade, such as captain, major, or lieutenant colonel, are dictated by the level of responsibility each job demands. The more responsibility the higher the rank requirement. Second, what officer talents are required by the Army is specified in terms of the skill dimension. The age of technology and its influx in military weapons, communications and other operating systems dictates a need for officers with technical skills. Technically complex and specific type skill requirements can be found in the areas of communications, electronics and engineering , to name only a few. Ultimately, the Army force planners and personnel managers must control the structure of the officer corps to simultaneously satisfy both rank and skill requirements of this large complex organization.

Other variables also cast complexity into the arena of force planning and personnel management. The degree of precision with which accessions of new officers and retention of experienced officers are forecasted can radically alter the stablity of personnel policies and programs. These variables effect the degree Army manpower requirements are satisfactorily met.

Interwoven in each of the variables and requirements just cited is the humanistic principles that the Army, as an organization, must be sensitive to the needs of the officer corps and try to satisfy personal desires and expectations of a military career. No doubt an Army can exist without concern for these variables but the health of such an Army would be questionable. Solutions which balance these variables must be tempered with the customs and traditions of the Army when implemented in order to maximize effectiveness.

Without question, there is a need to integrate all aspects of the officer personnel management policies and systems in an effort to accommodate this myriad of variables. The challenge of achieving the goal of providing a stable force in peacetime which is prepared for war is a constant battle by itself. For this reason the application of modern technology is but one means of adding order to the potential chaos of force planning. Computer technology makes available tools which allow the updating of information on the officer force profile which can assist in improving force management and planning.

Microcomputer electronic spreadsheet technology is a powerful tool in the hands of the force planner and personnel manager. It is a powerful tool because it can give quick and reliable answers to the user. Plans can be easily updated as often as new or more accurate information becomes available. Another use for this powerful tool is to give quick and reliable answers to "What if?" questions based on different combinations of policy parameters and simulated data. Using such automated technology to replace manual procedures opens many doors to the force planner and personnel manager. Not only is the speed of getting answers greatly increased but the reliability of those answers are also improved through computerization.

In the final analysis, the benefits of the application of microcomputer spreadsheet technology is increased productivity. Electronic spreadsheet production of the Five Year Field Grade Officer Promotion Plan allows the force planner and personnel manager to spend his or her time thinking in analytical terms rather than doing repetitive mathematical procedures which distract from more productive activities.

II. BACKGROUND

The Officer Personnel Management System (OPMS) and the Defense Officer Personnel Management Act (DOPMA) drive the wheels of personnel management for the US Army officer corps. OPMS is the system which plans, monitors and adjusts the nature of the officer corps to best meet Army requirements. DOPMA is the legal basis for the constraints Congress imposes on all the armed services in the area of officer force management. OPMS constantly adjusts itself to live in harmony with DOPMA. The armed services have the obligation to insure their policies, programs and directives stay within the bounds of law and are in keeping with the spirit of DOPMA legislation.

OPMS and DOPMA are recent evolutionary phenomena in the officer personnel management arena. It is important to briefly trace their "roots" because understanding why and how they evolved gives insight into the spirit of the laws enacted by Congress.

In the late 1960's and early 1970's federal politicians began calling for reform in the manner all the armed services managed their officer personnel. In 1970 the US Army responded by initiating a study group at the Army War College to explore the growing problem of managing the Army officer corps. This study group dealt with a number of complex issues, a few of which are listed here: [Ref. 1]

1. How to reduce, in an orderly fashion, the size of the Army from its Viet Nam level?
2. How to deal with the increased demand for specialization?
3. How to correct officer skill imbalances?

4. How to correct the current promotion system which encouraged generalization?
5. How to achieve the goal of improving professionalism and increasing career satisfaction?

The results of this study group formed the basis for the OPMS known today. OPMS was implemented in 1972 and in the past decade proved to be flexible in adapting to the dynamics of complex manpower management challenges. From its inception, OPMS objectives have been: [Ref. 2]

1. Develop officers in the right numbers and right skills to satisfy Army requirements.
2. Assign officers according to Army needs and individual desires.
3. Improve the motivation and satisfaction of the commissioned officer corps through a disciplined dual specialty professional development system.

Since implementation, numerous revisions have occurred in the policies and programs used to achieve the OPMS objectives just cited. The revision most related to this thesis topic is the centralized selection process used for promotions within the officer corps. This topic is discussed in detail in Chapter III.

While OPMS provides the operating system used to manage the officer corps, DOPMA provides the foundation on which OPMS must operate. As Congress adjusts the parameters in DOPMA, the Army must adjust OPMS policies and programs to comply with DOPMA. Such harmony has not always been the case.

The "roots" of DOPMA can be traced back to the Officer Personnel Act (OPA) of 1947. Many policies of the OPA can be found in todays DOPMA. Two examples, which are directly applicable to this thesis and are discussed in Chapter III are:

1. The "up or out" system of promotion.

2. Advance through grade by Year Group (YG).

Following the Korean conflict the Army was once again faced with the problems of reducing a wartime size Army. The Officer Grade Limitation Act (OGLA) of 1954 was Congress's solution. The OGLA's goal was to place specific limits on the number of regular and reserve officers who could serve on active duty in the grades of major and above.

OGLA did not solve all the problems. The newly created Air Force branch began asking Congress for and receiving annual grade relief from the OGLA ceilings. This occurred every year from 1965 to 1980. Also each service had its own promotion policy. These problems prompted Congress to push the Department of Defense (DOD) for a better solution. The DOD study was concluded in 1972 and proposed new legislation called DOPMA. DOPMA was first submitted to Congress in 1973 but years of legislative haggling prevented its passage. Finally, a compromise version of DOPMA was signed into law in December 1980 with an effective date of 15 September 1981. [Ref. 3]

Title 10 of the United States Code (USC) contains the general and permanent laws of the United States which govern the Armed Forces. The specific DOPMA directives discussed in this thesis can be found in Title 10 USC. The DOPMA provisions applicable to this thesis are listed below: [Ref. 4]

1. Modified the "up or out" promotion policy.
2. Standardized the promotion process throughout all services.
3. Provided a great deal of flexibility for the Service Secretaries.
4. Gave a great deal of power to the Secretary of Defense in managing that flexibility.
5. Called for a Five Year Field Grade Officer Promotion Plan to be developed and submitted to Congress for approval annually.

III. THE US ARMY PROMOTION SYSTEM

An understanding of the US Army promotion process is crucial if the Five Year Field Grade Officer Promotion Plan is to be produced in a logical manner. The objective of the promotion process, its mechanics, and its consequences are all key elements that need to be understood. The promotion process is a vital aspect of the officer personnel management system and affects each and every officer. For this reason, the process must be legally correct, logically sound and administrated in a fair and equitable manner. To do otherwise would jeopardize the effectiveness of the officer corps. [Ref. 5]

This thesis deals with the integration of the OPMS policies and procedures used in managing the officer corps within the applicable legislative directives and constraints imposed by DOPMA and Title 10 USC. Its is worthwhile to first review the objectives of the promotion process before getting into the details of the process. Although the specific procedures of selecting officers for promotion have changed over time, the objectives of this process have remained constant and are summarized below:

1. Meet Army specialty and grade requirements.
2. Insure advancement to the higher grades of the best qualified officers.
3. Provide career incentive.
4. Promote officers based on potential, not as a reward for past performance.

While not a specific objective, the process serves to identify and eliminate the ineffective officer. [Ref. 6]

Before continuing this examination of the Army promotion system, it is beneficial to establish clear definitions of

promotion process terminology. The terms listed below will be used often in the following discussions. Since not all terms used in the promotion system are explained here, the reader should consult the glossary located in Appendix D for any clarification of terminology.

The first term to understand is "Year Group" (YG). A cohort of newly commissioned officers who enter active duty within the same fiscal year are considered to be members of the same YG. The promotion process uses the YG concept when selecting officers for promotion. All the members of an eligible YG cohort are considered for promotion together. Another way to say this is that the promotion zone (a term to be explained shortly) is defined so that it includes all the members of the eligible YG cohort.

An officer's "Date of Rank" is the calendar date on which the officer actually or constructively was appointed in a particular grade. The date of rank is used to determine relative seniority for officers holding the same grade. This term is used frequently in any promotion process discussion.

Next, the term "Active Duty List" (ADL) refers to a single list of all officers (other than those described in section 641 of Title 10 USC) who are on active duty. Officers are carried on the ADL in the order of seniority based on grade. Officers serving in the same grade are carried in order of their date of rank within that grade.

A "Competitive Category" is a group of commissioned officers who compete among themselves for promotion, and if selected, are promoted in rank order as additional officers in the higher grade are needed in the competitive category. The Secretary of the Army established nine different competitive categories. The glossary in Appendix D lists these nine Army competitive categories.

The term "Promotion Board" refers to a centralized promotion process by which a group of senior Army officers review the records of those officers being considered for promotion. To be eligible for promotion consideration an officer must satisfy DOPMA prerequisites which are outlined later in this chapter. Promotion boards are asked to recommend officers for promotion from an inclusive zone of eligibility.

The term "Promotion Zone" (PZ) refers to an eligibility window which is defined by an announced range of calender dates. These dates represent the date of rank of the most senior officer and most junior officer in the PZ. This window is the zone of consideration and consists of commissioned officers on the ADL of the same grade and competitive category who are eligible for promotion consideration for the first time (excluding any below the zone consideration, a topic discussed later in this chapter).

Although mostly officers in the PZ are considered for promotion, there are other officers, both senior and junior to those in the PZ, who are under consideration. This way there are three categories of officers considered for promotion: Above Zone (AZ), In Zone (IZ) and Below Zone (BZ). The AZ category refers to those officers on the ADL of the same grade and competitive category who are eligible for promotion consideration and whose date of rank is senior to any officer in the PZ. The officers in the AZ category have been previously considered for promotion by at least one promotion board but failed to be selected. The term IZ is synonymous to PZ as defined in the previous paragraph. The term BZ refers to those officers on the ADL of the same grade and competitive category who are eligible for promotion consideration and whose date of rank is junior to any officer in the PZ (IZ).

Another term to be familiar with is "due course" officer. A "due course" officer is one who has never failed to be selected from the IZ when first considered and who has never been selected from the BZ to any grade. A "due course" officer has always made his promotions "on time", never early or late.

The final term to understand is "promotion list". This is a list of officers, by competitive category, recommended and approved for promotion. Officers are placed on the "promotion list" in order of their seniority based on the ADL. These officers are promoted to the next higher grade when additional officers in that grade and competitive category are needed. Promotions are made in the order the names appear on the "promotion list" after all officers previously selected for promotion have been promoted. This is a key point to remember when producing the Five Year Field Grade Officer Promotion Plan.

With these terms in mind, attention can now be focused on the more specific mechanics of promotion system operations.

Promotion boards convened at Headquarters, Department of the Army will recommend officers for promotion. Promotion boards are convened annually and follow Secretary of the Army guidance and instructions. A separate promotion board is convened for each competitive category and grade, however, such boards may be convened concurrently.

Promotion boards consist of at least five ADL officers of the Army. Each officer must be a major or above and serving in a grade higher than that of the officers under consideration. Promotion board membership is based on personal qualifications, experience and manner of performance. Board members are selected by the major field commanders from lists of eligible candidates who meet qualifications in a broad-spectrum of military fields.

Each promotion board receives a Letter of Instruction (LOI) from the Secretary of the Army providing quidance for the selection process. Copies of these letters are released to the officer corps and contain the following specific information: [Ref. 7]

1. Oath to be taken by board members.
2. Reports to be made.
3. Methods of selection.
4. Factors to be considered, including the Army's needs in each officer skill specialty.
5. Maximum number of officers to be selected.
6. Other information as required.

The LOI highlights the need for different officer professional development patterns required for accomplishment of the Army's mission. Instead of a single, traditionally accepted pattern through various grades, there are multiple paths for advancement, because the Army recognizes divergent service needs and individual capabilities. The promotion board is instructed to focus on the proficiency of performance and not be unduly influenced by diversity of assignments or the level at which duties are performed. In essence, instead of evaluating the specialized or generalized nature of an officer's assignment, the point to be evaluated is "What are the demonstrated abilities and indicated potential of this officer?" Further, instructions to promotion boards prescribe that promotion potential will be determined, for the most part, based on an officer's record of performance in his initial primary specialty area, performance in his additional specialty area and his overall performance.

The criteria of selection used by each promotion board is included in the Secretary of the Army's LOI. Promotion boards use either the "fully qualified" criteria or the "best qualified" criteria. When promotion quotas equal the

number of officers being considered, a "fully qualified" criteria is prescribed to the board. Under this criteria, a "fully qualified" officer is one who is qualified professionally and morally, is of demonstrated integrity, and able to perform the duties expected of an officer of his or her qualifications in the next higher grade. In contrast, when boards are instructed to recommend for promotion fewer officers than are being considered, they operate under a "best qualified " criteria. No officer will be recommended under this method unless a majority of the board determines that he or she is "fully qualified" for promotion. Recommendations are based upon the "whole man" concept and take into consideration such factors as performance,. efficiency, seniority, age, ability and education, both military and civilian. Additionally, lieutenant colonel (LTC) and colonel (COL) promotion boards are provided quotas to be selected from each specialty area to insure the Army's skill/grade mix is in balance with its needs and officers who are "fully qualified" are selected to fill these specialty needs. No matter what criteria is used, all officers considered by a promotion board must either be; (1) classified as recommended for promotion or (2) failed selection for promotion. [Ref. 8]

The selections made by a promotion board are recommendations to the President of the United States and are not binding. The names of the officers approved by the President are placed, in order of seniority, on a promotion list published by the Army's Military Personnel Center (MILPERCEN). Separate lists are published and maintained for each competitive category. Officers are promoted from the promotion list in order of seniority, shown by the promotion sequence number, as additional officers are needed within each competitive category. Another way of stating this is that officers are promoted to fill vacancies in the next higher grade.

Another important aspect of the Army promotion system that needs to be understood is the BZ promotion process. The BZ promotions are designed to allow the accelerated promotion of those outstanding officers who have demonstrated performance and indicated potential superior to their peers. BZ promotions are an essential part of the promotion system because they:

1. Provide officers with exceptional ability an opportunity to advance quickly to more responsible positions;
2. Help retain high quality officers;
3. Give officers an incentive to perform at their highest potential.

Promotion boards considering officers for major, lieutenant colonel, colonel and general officer ranks may recommend officers for promotion from the BZ subject to the constraints listed in the promotion board LOI. The nature of these constraints are discussed in detail in Chapter IV. Since only a few officers may be selected for promotion from BZ, failure to be selected neither counts as a nonselection for promotion nor reflects unfavorably on the officer. [Ref. 9]

Another aspect of the promotion system that needs to be understood deals with those officers who fail twice to be selected for promotion by promotion boards in successive years. The intricate details of existing Army Regulations pertaining to this aspect of the promotion system are not important to this thesis; however, the consequences of twice failing selection are important. The consequences are: [Ref. 10]

1. Discharge from the service ; or
2. Mandatory retirement, if eligible.

The final aspect of the Army promotion system that needs to be understood is the "Selective Continuation" program.

Subject to the needs of the Army, an officer pending separation because of having failed twice to be selected for promotion to major or lieutenant colonel may be continued on active duty in his or her present grade. Furthermore, a selective continuation selection board must recommend the officer for continuation and the Secretary of the Army must approve the recommendation before an officer may be continued. Selectively continued officers are eligible for selection for promotion until separated from the Army. [Ref. 11] This aspect of the promotion system provides the Secretary of the Army with the managerial flexibility needed to satisfy unique manpower requirements. The group of officers who are selectively continued must be accounted for in a unique fashion when producing the Five Year Field Grade Promotion Plan. This special accounting procedure is discussed in Chaper IV.

IV. PROBLEM DEFINITION AND ANALYSIS OF CONSTRAINTS AND INPUTS

The Congress of the United States requires each of the armed services to annually submit a Five Year Field Grade Officer Promotion Plan for their review and approval. This requirement is clearly expressed in the DOPMA legislation enacted in 1980. The problem presented in this thesis is "How can this Congressional requirement of producing a five year Field Grade Officer Promotion Plan, be met in a more efficient and reliable manner than is currently being done?" The thesis presents an alternative to the current method used by MILPERCEN force planners in producing the Five Year Promotion Plan. The goal is to demonstrate a more efficient and reliable technique to produce this document. This accomplishment should increase the productivity of force planners and personnel managers.

Currently the force planners at MILPERCEN produce the Five Year Promotion Plan by manual computations. The manual technique is laborious in nature, repetitive in its procedures and , as such, prone to human error. The nature of the logic used in producing this plan allows errors to be carried forward through all subsequent calculations thus impairing the reliability of the final product. This thesis produces an automated version of the plan through use of microcomputers and electronic spreadsheet technology and thereby demonstrates how readily available state-of-the-art commercial software packages can be used to permanently automate the production of the Five Year Promotion Plan.

The automated technique presented in this thesis does not guaranty the accuracy of the Army's Five Year Promotion Plan. Increased accuracy can only be achieved through

refinement of the accuracy of the forecasted data used as inputs to the plan. Examination on how to improve or refine the forecasted data is beyond the scope of this thesis. The thesis concentrates on the documentation of the mathematical logic used to produce the plan and demonstrates how the automation of this logic can improve the productivity of force planners and personnel managers.

Before explaining the mathematical logic used to produce the Five Year Promotion Plan it is necessary to discuss two topics in detail. The first topic concerns a brief description of the specific group of officers for whom the promotion plan is being produced in the thesis. By necessity, the second topic requires a more detailed discussion and focuses on the constraints and parameters that shape the environment in which the promotion system must operate.

As explained in Chapter III the Secretary of the Army has established nine different "competitive categories" of commissioned officers and the officers within each category must compete among themselves for promotion. By far the largest of the nine competitive categories consists of those officers who are managed by the Officer Personnel Management Directorate (OPMD). The abbreviated title of this competitive category is "Army". Although the Five Year Field Grade Officer Promotion Plan developed for the "Army" competitive category is the example used in this thesis, the technique can be applied to any other of the nine categories, as well.

Next attention will be focused on the constraints and parameters which shape the promotion system environment.

A. DOPMA CONSTRAINTS AND OBJECTIVES.

Congress enacted DOPMA to set forth legally binding constraints, goals and objectives on the officer corps. The reason Congress requires the armed services to submit an

annual Five Year Field Grade Officer Promotion Plan is for Congress to see how well the services are complying with the law. A key issue in this thesis is that Congress and DOD designed DOPMA to provide common provisions governing career expectations in the various grades and to control the number of senior officers on active duty. The constraints found in DOPMA are designed to achieve this end.

B. DOPMA END STRENGTH CEILINGS.

The first DOPMA constraint the plan must consider is the fiscal year (FY) end strength ceilings dictated for each senior officer grade. The distribution of grades, major (MAJ) and above, is established and controlled by DOPMA. This distribution may be further constrained by Congress, the Secretary of the Army or the Chief of Staff of the Army. Though DOPMA is subject to revision and modification, the basic concept remains unchanged. In effect, the by-grade number of field grade officer authorizations is a function of the total officer authorized strength levels. The total number of officer authorizations is based on the total size of the Army and is prescribed by the Secretary of the Army. As the size of the Army expands and contracts so does the number of field grade officer authorizations. Any actual or forecasted changes in DOPMA field grade officer authorizations and their distribution must be accounted for when producing the Five Year Promotion Plan. The data source for this information is discussed later in this chapter.

C. PROMOTION FLOW.

The next constraints DOPMA imposes are designed to deal with the issue of career expectations. Without a doubt, DOPMA guarantees no one a career as a commissioned officer. There are numerous programs in place which are designed to

identify and eliminate officers who fail to meet minimum standards. However, DOPMA does intend to give those officers who choose a military career a sense of job security by outlining provisions that govern normal career progression. These provisions of DOPMA are designed to lower career anxieties of officer personnel by mapping out a "promotion flow" through the officer ranks. Congress and the Army's force planners monitor the promotion flow by using the Five Year Promotion Plan.

The promotion flow for each officer cohort (YG) can and normally does change from YG to YG. Changes in DOPMA authorizations, losses and promotions to the next higher grade create fluctuations in both time in service (TIS) and time in grade (TIG) at which promotions occur. The fluctuations in the timing and numbers of vacancies needing to be filled create differences in TIG and TIS of "due course" officers in each YG as they pass through the senior grades. Under ideal circumstances, each qualified officer should advance through the grade structure with some degree of predictability as established in the DOPMA legislation. This relatively standardized promotion flow is not consistently obtainable due to expansions and contractions in authorizations, changes in promotion policies and variations in officer losses each year.

The promotion flow is first controlled by established minimum TIG requirements for promotion to the next higher grade. The established DOPMA minimum TIG requirements for field grade officers are shown in Table I.

An alternate format for the DOPMA promotion flow objectives is in terms of years of Active Federal Commissioned Service (AFCS). This format is shown in Table II. It is in this format that the DOPMA objectives for the promotion flow is monitored on the Five Year Field Grade Officer Promotion Plan. It is important to note that DOPMA recognizes the

TABLE I

MIMIMUM TIME IN GRADE CONSTRAINTS

Promotion To	Minimum TIG
MAJ	3 years
LTC	3 years
COL	3 years

infeasibility of establishing a ridged AFCS promotion point. DOPMA provides a two year window around each AFCS promotion phase point to allow for uncontrollable fluctuations in vacancy availability. Compliance with the promotion flow constraint is judged by comparing the years of AFCS of the last due course officer on a promotion list at the time of his or her promotion with the established DOPMA years of AFCS objective for that grade.

TABLE II

YEARS OF AFCS CONSTRAINTS

Promotion To	Years of AFCS
MAJ	10 (+/- 1)
LTC	16 (+/- 1)
COL	22 (+/- 1)

D. CUMULATIVE OPPORTUNITY FOR PROMOTION.

Another constraint DOPMA imposes on the promotion system deals with the probability of being selected for promotion. By publishing an established policy on cumulative opportunity (probability) of being selected for promotion from one grade to the next, career expectations are reinforced. The DOPMA objectives concerning cumulative opportunity for each field grade is listed below in Table III.

TABLE III
PROMOTION OPPORTUNITY CONSTRAINTS

Promotion To	Cumulative Opportunity
MAJ	80%
LTC	70%
COL	50%

Since selection can occur from any of the three zones of consideration (BZ, IZ or AZ) the cumulative opportunity is merely the sum of the three probabilities of being selected from the three zones.

Let,

$P(S)$= the cumulative probability of being selected;

$P(BZ)$= the probability of being selected from the BZ;

$P(\overline{BZ})$= the probability of not being selected from the BZ;

$P(IZ|\overline{BZ})$= the probability of being selected from the IZ given the officer was not selected from the BZ;

$P(\overline{IZ}|\overline{BZ})$= the probability of not being selected

from the IZ given the officer was not selected from the BZ; and

$P(AZ|\overline{BZ}\cap\overline{IZ})$= the probability of being selected from the AZ given the officer was not selected from the BZ or IZ.

Then,

$$P(S)= P(BZ)+ P(\overline{BZ})P(IZ|\overline{BZ})+ P(\overline{BZ})P(\overline{IZ}|\overline{BZ})P(AZ|\overline{BZ}\cap\overline{IZ}).$$

It is important to understand the following difference between actual promotion board guidance and the assumption the Five Year Promotion Plan uses to simulate that same guidance. First, the point was made in Chapter III that the promotion board must consider "real people" and make judgements on their past performance and demonstrated promotion potential. For this reason the Secretary of the Army's LOI specifically states that persons in the AZ and the IZ are to be judged <u>together</u> against the same criteria. No quotas or guidelines for selection from either zone are given to the promotion board members. The only quota issued by the Secretary of the Army is a single selection ceiling. The board may select fewer but no more than this number from all those considered in the IZ and the AZ. (The ceiling on BZ selections is discussed later in this chapter.) In contrast to how an actual promotion board operates, the logic used in producing the Five Year Promotion Plan relies on mathematical assumptions. Namely, it is assumed that the boards are given quotas to meet in both the IZ and the AZ. This is the basis for the commonly heard saying "Promotion boards deal with 'faces' while force planners must deal with 'spaces'." This assumption is based on a historical analysis of actual promotion board results. This historical analysis indicates there is little variation from one promotion board to the

next in the actual percentages of personnel selected from the AZ and the IZ. For this reason, as a matter of MILPERCEN convention the parameters used to produce the Five Year Promotion Plan are listed below in Table IV. By monitoring actual results of future promotion boards force planners can alter the values for $P(IZ|\overline{BZ})$ and $P(AZ|\overline{BZ}\cap\overline{IZ})$ as parameters to reflect historical trends.

TABLE IV

PROMOTION ZONE PARAMETERS

% Selected From Those Considered	MAJ	LTC	COL
AZ = $P(AZ\|\overline{BZ}\cap\overline{IZ})$	.19	.13	.04
IZ = $P(IZ\|\overline{BZ})$	.75	.67	.47

E. BELOW ZONE PROMOTION CONSTRAINTS.

In Chapter III the reasons for BZ promotions were explained, now the actual BZ promotion constraints are examined. DOPMA authorizes a maximum of five percent of the promotion list to MAJ and ten percent of the promotion list to LTC and COL to come from officers in the BZ. In both actuality and the mathematical logic used in the Five Year Promotion Plan the numbers to be selected from the BZ cannot be computed until the number selected from the AZ and IZ are known. By law the constraint is worded to reflect a selection ceiling based on a percentage of the entire list. This differs from the historically developed parameter based selection technique applied to the AZ and the IZ personnel, i.e. the way $P(AZ|\overline{BZ}\cap\overline{IZ})$ and $P(IZ|\overline{BZ})$ are specified.

One other difference to note deals with rounding when the number of the BZ selected is computed to be a fraction. In this case this number is always rounded down to the next whole number. In contrast, calculations for the number of the AZ selected and the IZ selected follow normal rounding rules. The number of the BZ selected is rounded down to assure absolute compliance with the DOPMA BZ selection constraints which dictate a maximum number of promotions from officers in the BZ. Occasionally the DOPMA constraints would be violated by one too many promotions if normal rounding rules were followed and fractions of .5 or greater were rounded to the next higher whole number.

The BZ selection constraints imposed by DOPMA are computed in the following manner using the given quantities:

AZ Sel= the number of officers selected from AZ;
IZ Sel= the number of officers selected from IZ; and
BZ Sel= the number of officers selected from BZ.

Then,

Total Sel= BZ Sel + IZ Sel + AZ Sel.

Let,

p = the percentage of BZ selectees as constrained by DOPMA.

Then,

BZ Sel= (Total Sel) p = (BZ Sel + IZ Sel + AZ Sel) p.

Therefore,

$$\text{BZ Sel} = \frac{(\text{AZ Sel} + \text{IZ Sel})\, p}{1 - p} .$$

Example: Given that a promotion board selected 38 LTC from the AZ and 456 LTC from the IZ for promotion to COL,

$$\text{BZ Sel} = \frac{(38 + 456)\ .1}{1 - .1} = 54 .$$

In this manner the maximum number of officers allowed to be selected from the BZ is computed. The Five Year Promotion Plan makes the assumption that the board will select the maximum number allowed from the BZ. Seldom do actual promotion boards select the maximum number authorized because of the stringent quality criteria which must be met for early promotion.

A brief recapitulation of all the DOPMA constraints and parameters used to shape the Five Year Promotion Plan is found in Table V.

TABLE V
CONSOLIDATED DOPMA CONSTRAINTS/PARAMETERS

	MAJ	LTC	COL
Years AFCS	10(+/-1)	16(+/-1)	22(+/-1)
Cumulative Opportunity	80%	70%	50%
% Sel from AZ	19%	13%	4%
% Sel from IZ	75%	67%	47%
BZ % of Total Sel	5%	10%	10%

F. BOARD YEAR VS PROMOTION YEAR.

Another concept that must be explained is the difference between "board year" and "promotion year". First of all, both concepts deal in terms of the government fiscal years which start on 1 October and end on 30 September. The "board year" refers to the fiscal year in which the promotion board was convened. As explained in Chapter III,

separate promotion boards are convened for each grade and competitive category but they may be convened concurrently. Promotion boards are tasked to select officers during the "board year" for promotion during the following fiscal year, which is termed the "promotion year". Officers selected for promotion and placed on a promotion list enter the linear promotion queue and wait for vacancies to occur. Previous promotion lists must be completely exhausted before the most recent promotion list is used to fill officer vacancies.

From this point on, the following fiscal year (FY) notation will be adopted for use when explaining the logic used to produce the Five Year Promotion Plan:

FY(t) where t = -1,0,1,2,3,4,5,

with t = 0 referring to the FY under consideration.

Therefore, when FY(0) represents the current "board year", then FY(1) is the "promotion year" for the officers selected in FY(0). Carrying this one step further, the "board year" calculations for FY(t), with t = 1,2,3,4,5, represent the out-years which make up the Five Year Promotion Plan.

G. PROMOTION CAPABILITY.

As stated earlier, the armed services promote officers to fill authorized vacancies in each grade. The number of vacancies available in a grade in a given promotion year is called the "promotion capability" for the grade directly below. Promotion Capability (PC) is simply the sum of the number of vacancies expected to be available during a promotion year from three sources. The three sources are losses, promotions to the next higher grade and the net change in DOPMA authorizations. For any given promotion year, FY(t), the promotion capability for a specific grade is computed using the following mathematical expression:

$$PC(t) = L(t) + P(t) + D(t-1,t),$$

here,

PC(t) = the promotion capability during FY(t);

L(t) = the forecasted losses during FY(t);

P(t) = the forecasted promotions to the next higher grade during FY(t); and

D(t-1,t) = the net change in forecasted DOPMA authorizations for the specific grade from the previous fiscal year. This value may be positive reflecting an increase or negative indicating a decrease in authorizations.

The data source which gives the force planner the values for computing the promotion capability is the Officer Force Implementation Plan (OFIP). The OFIP is published three times per year and incorporates the most up-to-date information on current inventory, projected force structure and specific grade and skill data. The OFIP then projects out to seven years into the future the nature of the OPMD officer corps.

The first set of forecasted data we retrieve from the OFIP is "Loss" data, L(t). Within the OFIP there are sections labeled "FY(t) Projections". Within each section there are tables labeled "By Grade Loss Requirements for FY(t)". These tables represent the numbers of officers from each grade that must be removed from the Army during FY(t) in order to meet the projected inventory for that grade, as constrained by DOPMA legislation and end strength limitations, that best satisfy OPMD requirements. (In this sense, officer attrition (loss) is the total of all the retirements, deaths and separations from the Army during a specific fiscal year for each officer grade.) The required losses in this table are not an educated guess on how many

officers will happen to end their Army careers. It is a target force planners aim to achieve. As time passes, personnel policies are adjusted to release more or retain more officers as needed to hit the target of required losses. The numbers extracted from the "By Grade Loss Requirements for FY(t)" tables are used as the L(t) values when computing promotion capability for the grades of LTC and MAJ only. The grade of COL is handled somewhat differently.

General officers are not managed by OPMD. All promotions to general officer are actually losses to the OPMD system. In contrast, promotions to the next higher grade for grades LTC and below are not losses to the OPMD system, as these officers have not left OPMD, just changed their rank. Therefore, the OFIP loss data for the grade of COL includes both promotions to brigadier general (BG) and the losses due to retirements, separations, deaths, etc. Knowing this fact about the OFIP and in order to display promotions to BG in the Promotion Plan, the annual number of promotions to BG is substracted from the losses as obtained from the OFIP for the grade of COL, then added back into the equation for PC(t) as the value for P(t), i.e. promotions to the next higher grade.

The next element in the expression for promotion capability represents the vacancies created as a result of officers being promoted to the next higher grade, P(t). As these officers get promoted, vacancies are left behind in their old grade. Therefore, the starting point in forecasting the numbers of officers being promoted out of a grade must start at the top and work itself down through the grades one at a time.

Based on historical data the number of colonels being promoted to BG have been 50 per year. For this reason, it is a matter of MILPERCEN policy to use the number 50 as the

P(t) value when computing the PC(t) for the rank of COL. Since the computation of promotions must start at the top grade and work its way down through the system, the total PC(t) for COL becomes the P(t) for LTC. That is, the sum total of all colonel vacancies in a given year will be filled by promoting the same number of lieutenant colonels. Mathematically stated: COL PC(t) = LTC P(t). Similarly for MAJ: LTC PC(t) = MAJ P(t). As a result, only the inital yearly promotions to BG must be assumed when calculating the PC(t) for all three field grade ranks.

Finally the last value used to compute the PC(t) is the net change in DOPMA authorizations from FY(t-1) to FY(t). The OFIP is the source document for the data needed to compute the net change in DOPMA authorizations. The OFIP lists the projected FY end strengths for each grade out to seven years in the future. Calculations for the net (plus or minus) change in DOPMA authorizations for any given FY(t) can be accomplished using the formula:

DOPMA change for FY(t)= DOPMA authorizations for FY(t)
- DOPMA authorizations for FY(t-1).

H. FORECASTING THE IN ZONE AND THE ABOVE ZONE CONSIDERED.

The OFIP also serves as the source document for the forecasted numbers of officers to be considered for promotion in the AZ and IZ. This forecasted data is extracted from the same sections in the OFIP as the forecasted required losses. The tables used are titled "End FY(t) Inventory By Year Group and Grade". The following discussion outlines the logic and procedures used to extract the needed data from these tables in the OFIP. The mathematical expressions presented represent the basic computations. However, these computations are subject to modification by the force planner in order to refine the data based on any

known peculiar YG information. (An example of such a modification is presented at the end of this discussion on forecasting the number of officers to be considered.) We begin with determining the number of captains to be considered for promotion to major. Next we will look at majors considered for promotion to lieutenant colonel and finish with the lieutenant colonels being considered for promotion to colonel.

The goal is to calculate the forecasted numbers of captains who will be considered for promotion to major from the IZ during the board year, FY(t). First, the IZ YG for any board year, FY(t), can be calculated by subtracting 10 years from the given board year. The mathematical expression is simply:

FY(t) - 10 = the YG of the in zone considered.

Once the IZ YG is known, IZ Cons could be extracted from the "End of FY(t) Inventory" tables in the OFIP using the following expression:

IZ Cons = x,
where,
x = the number of CPT's in the IZ YG from the OFIP.

However, a practical problem arises in connection with the IZ Cons. Force planners at MILPERCEN have considerable confidence in the accuracy of the total number of officers in each YG shown in the OFIP but the grade distribution within the YG's historically has not been found as accurate for use in producing the Five Year Promotion Plan. Any detailed analysis of how the OFIP derives its numbers is beyond the scope of this thesis but empirical analysis of its grade distribution justifies a modification to the formula just described when computing IZ Cons. Therefore, the formula is modified to include a second value, y, when

determining IZ Cons. The value y represents the number of MAJ's in the IZ YG listed in the OFIP just the to right of the value x which has already been extracted. The value of y is usually much smaller than that of x. Part of the justification for including y in the computation is based on the fact that the OFIP projects FY end strengths, whereas, promotions boards are held well before the end of the FY. In any event, historical analysis has shown that because of time lags and other flaws in the OFIP logic a more accurate forecast of IZ Cons is achieved by disregarding the OFIP grade distribution and combining the values of x and y. (This same approach is used in determining IZ Cons for promotion to LTC and COL which will be discussed later in this chapter.) By following the same procedures for each year included in the Five Year Promotion Plan, the forecasted values for IZ Cons for board years FY(1) through FY(5) are obtained. The modified formula is listed below showing the inclusion of the y value.

IZ Cons = x + y,

where,

x = the number of CPT's in the IZ YG from the OFIP and

y = the number of MAJ's in the IZ YG from the OFIP.

The calculations for the forecasted number of captains who will be considered for promotion to MAJ from the AZ is more involved. The number of Above Zone considered (AZ Cons) for board year FY(t) is calculated using the expression:

$$\text{AZ Cons} = \sum_{i=11}^{12} a_i + b,$$

where,

a_i = the number of CPT's in YG(FY(t) - i) and

b = the number of CPT's who are on active duty as a result of the Selective

Continuation Program.

Since the IZ YG is (F(t)-10), the two previous IZ YG's, (F(t)-11) and (F(t)-12) are now in the AZ. All captains on active duty who are members of these two YG's are automatically considered for selection in the AZ.

The constant b, representing the number of Selective Continuation Program captains still on active duty, is obtained from the Promotions Branch at MILPERCEN. It is included here because, as explained at the end of Chapter III, DOPMA legislation states that selectively continued officers remain eligible for all promotion boards as long as they are on active duty.

The same "End of FY(t) Inventory" tables used to extract IZ Cons are used to obtain AZ Cons for board years FY(1) through FY(5).

The same principles, with appropriate modifications, are used to calculate IZ Cons and AZ Cons for majors being considered for promotion to lieutenant colonel. For majors the IZ YG for any board year FY(t) is FY(t) - 15. Again, for the same reasons cited earlier two numbers in "End of FY(t) Inventory" tables must be added together to determine IZ Cons:

IZ Cons = x + y ,

where,

x = the number of MAJ's in the IZ YG and

y = the number of LTC's in the IZ YG.

Using the same tables in the OFIP discussed above, extract the number of officers who are majors and lieutenant colonels in the IZ YG. The sum of these two numbers is IZ Cons for board year FY(t). Each successive board year IZ Cons is similarly obtained.

AZ Cons is calculated using the mathematical expression:

$$\text{AZ Cons} = \sum_{i=16}^{20} a_i ,$$

where,

a_i = the number of MAJ's in YG(FY(t) - i).

The range of YG's used to define the AZ include all the majors on active duty who are senior to every officer in the promotion zone, (IZ). DOPMA provisions require majors with 20 years of AFCS to retire. This accounts for the upper limit of 20 years AFCS being used to define the AZ YG's.

The computations and logic used to determine IZ Cons and AZ Cons for lieutenant colonels who are being considered for promotion to colonel are similar to the above calculations. The IZ YG for any given board year is calculated by subtracting 21 years from the given board year, FY(t):

FY(t) - 21 = the IZ YG.

Once again, two numbers in the "End FY(t) Inventory" tables must be added together to determine IZ Cons.

IZ Cons = x + y,

where,

x = the number of LTC's in the IZ YG and

y = the number of COL's in the IZ YG.

The same OFIP tables are used to extract the number of officers who are lieutenant colonels in the IZ YG. This is IZ Cons for board year FY(t). Repeating the same procedures for subsequent board years gives the respective IZ Cons needed to produce the Five Year Promotion Plan.

AZ Cons for promotion to colonel is computed by using the following mathematical expression:

$$\text{AZ Cons} = \sum_{i=21}^{28} a_i ,$$

where,

a_i = the number of LTC's in YG(FY(t) - i)

DOPMA provisions allow for officers in the grade of LTC to remain on active duty for a maximum of 28 years AFCS. This explaines the upper limit YG used to define the range for the AZ YG's. The range of YG's extending from (FY(t) - 22) through (FY(t) - 28), includes all lieutenant colonels on active duty who are senior to every lieutenant colonel in the promotion zone, IZ.

Mentioned earlier was the fact that force planners often modify these OFIP numbers to more closely represent reality. All modifications made are based on an understanding of the current promotion realities. An example of a modification could be altering AZ Cons for promotion to LTC. Instead of using AZ Cons = $\sum_{i=16}^{28} a_i$, the equation is modified to be AZ Cons = $1/2 \sum_{i=16}^{30} a_i$ based on the following reasoning. The extremely long list duration for promotion from MAJ to LTC causes an unusually long promotion list backlog plus the fact that majors on active duty are considered eligible for promotion board consideration even after twice failing to be selected. However, the OFIP does not indicate the number of officers who have already been selected for promotion by the previous board yet are still being carried on the OFIP list among majors. Normally this number is small enough to be ignored but when the promotion backlog approaches 18 to 24 months, as it has recently for promotion to LTC, it is no longer insignificant. When the promotion list backlog is extremely large the OFIP numbers must be modified to discount these officers. By far the majority of these officers were selected when they were in the IZ but a portion of these officers were selected in the AZ. No matter which is the case, the OFIP still indicates (incorrectly) that these officers are MAJ's in the AZ YG's. Historical analysis of this phenomenon reveals that approximately 50 percent of the majors in the AZ YG's, (FY(t) - 16) through (FY(t) - 20), have been selected for promotion by a previously held

promotion board but have not yet been promoted. This explains the above modification to AZ Cons.

I. ACTUAL PROMOTION BOARD AND CURRENT LIST DATA.

The Promotions Branch at MILPERCEN provides the force planners with other information of a more crucial character. This crucial information comes in two forms. First, actual results of the most recent promotion boards and second, the actual status of the most recent promotion list(s) for each grade. For the reasons already discussed the actual board results will differ slightly from the strict DOPMA and Department of the Army objectives because promotion boards deal with "faces" not "spaces".

The results of the most recent promotion board gives the actual numbers considered and selected from each of the three zones of consideration. This information is needed to establish the number of officers on the new promotion list.

The current status of the most recent promotion list(s) is the single most critical piece of information the Promotion Branch supplies. The force planners must know which promotion list(s) is (are) currently in effect and how many officers remain to be promoted from that (those) promotion list(s). Known data about the previous promotion list must include the years of AFCS for the last due course officer promoted from that list and the calendar date the list expired. These are the critical reference points. They serve as the solid foundation for the logic and assumptions used in producing a Five Year Promotion Plan. This actual data is used as the known starting point upon which the next five years of forecasts are based. Chapter V explains how the promotion forecasts are computed.

V. PROBLEM SOLUTION AND LOGIC USED

This chapter describes the mathematical logic and computations used to produce the Five Year Promotion Plan. The information is presented using the framework of the LOTUS 1-2-3 spreadsheet which automates the mathematical process currently done manually by MILPERCEN force planners. The discussion begins with a brief overview of the LOTUS 1-2-3 spreadsheet and the spreadsheet specifically developed to produce the Five Year Promotion Plan. As each section of the spreadsheet is presented, the mathematical logic and computations used within that section are explained. Chapter V is not intended to be an users guide for operating the Five Year Promotion Plan Spreadsheet. Chapter VI is a step-by-step demonstration designed to be user friendly and should be consulted when actually operating the Five Year Promotion Plan Spreadsheet.

LOTUS 1-2-3 is a commercially available state-of-the-art computer software package used with desk top personnel computers (microcomputers). LOTUS 1-2-3 uses a matrix spreadsheet made up of 256 columns and 2,048 rows. This 256 by 2,048 matrix generates 524,288 cells which are available for information storage. Electronically written on the LOTUS 1-2-3 spreadsheet matrix is the specifically developed Five Year Promotion Plan Spreadsheet. The information needed to produce the Five Year Promotion Plan is arrayed in the spreadsheet cells along with mathematical formulas which manipulate the information to produce the Five Year Promotion Plan. Information such as actual and forecasted data plus chosen parameters are placed in the appropriate cells and the mathematical computations are automatically performed as programmed to produce the outputs which make up the Five Year Promotion Plan.

The Five Year Promotion Plan spreadsheet is arranged into four major sections. Each section performs a different function and the layout of the sections within the spreadsheet is designed to facilitate use by the force planner. The four major sections of the Five Year Promotion Plan Spreadsheet are:

1. User Input Section,
2. Individual Grade Promotion Section,
3. Year & Month Accounting Section and
4. 5-Yr Promotion Plan Section.

A graphical representation of the layout of the Five Year Promotion Plan Spreadsheet is shown in Figure 5.1. This figure depicts the physical location of each of the four sections and their relative positions to one another. The subsections also shown in Figure 5.1 add further structure to the spreadsheet and will be explained later in the chapter.

The following discussion on the logic and computations used to produce the Five Year Promotion Plan is structured around the four major sections. The description of each section is sequentially presented below. The sections are presented in a fashion to facilitate the understanding of the mathematical logic and computations rather than to facilitate the actual operation of the Five Year Promotion Plan Spreadsheet.

A. USER INPUT SECTION

The first section of the Five Year Promotion Plan Spreadsheet is the User Input Section. As its name implies, it is in this section that the user inputs the forecasted and actual data and parameters outlined in Chapter IV. This section is the only portion of the Five Year Promotion Plan Spreadsheet where the user is allowed to make entries.

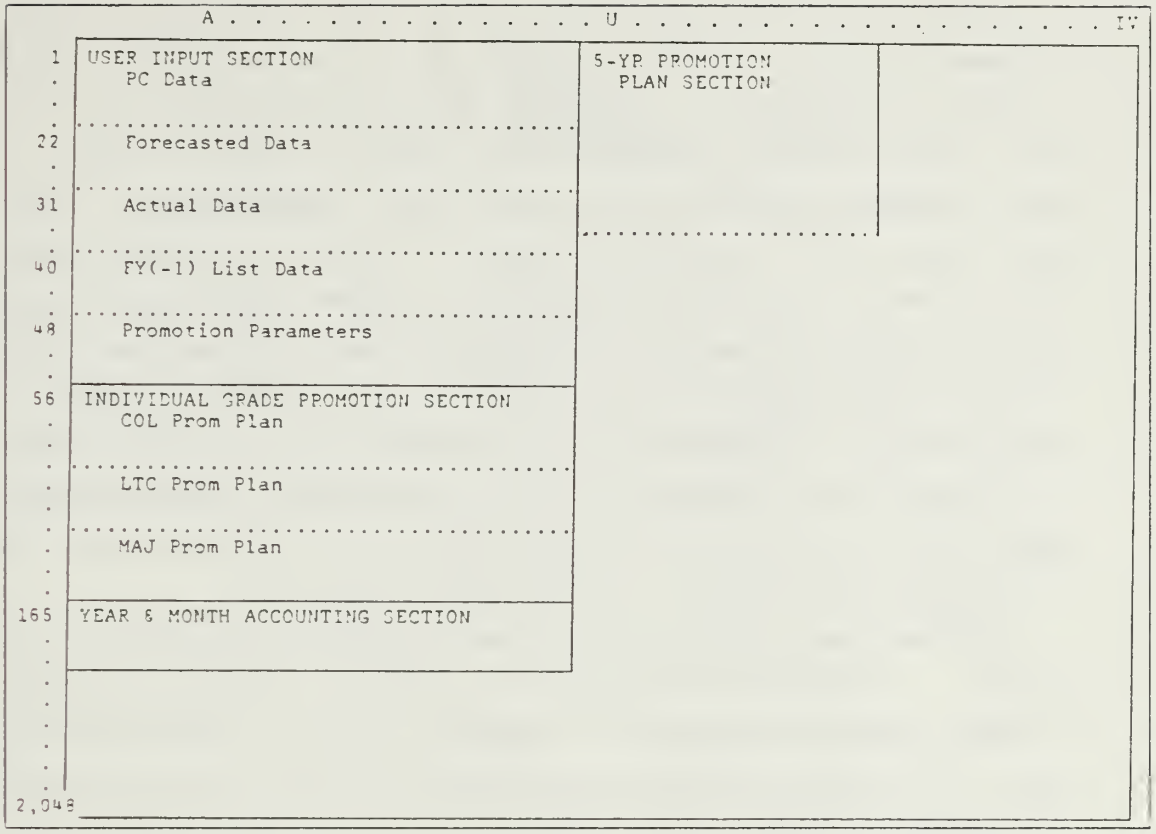


Figure 5.1 The Five Year Promotion Plan Spreadsheet.

There are two reasons for this. The first is to facilitate use of the spreadsheet. All of the data which are manually entered by the user into the appropriate spreadsheet cells are consolidated in one general area. Time is not wasted by moving all over the spreadsheet looking for the correct cell to input the given data. Also, the chance of entering data into an incorrect cell is reduced because the data is subdivided by type then entered into different subsections within the User Input Section. This allows for data to be quickly reviewed after being entered and then compared to other entries. Entry errors are more likely to be detected using this approach. These subsections will be briefly discussed later in this chapter.

The second reason this is the only section the users is allowed to make manual entries is to protect the integrity of the spreadsheet. Without invoking some means to protect the spreadsheet's mathematical logic, an operator could inadvertently render the spreadsheet useless by inputting given data into the wrong cell. LOTUS 1-2-3 provides this protection by only allowing data to be inputted in specifically designated cells. Although some mathematical computations are performed in the User Input Section, the spreadsheet is designed to transfer the inputted data to other sections of the Five Year Promotion Plan Spreadsheet. The transfered data is used to make calculations and display results in those other spreadsheet sections.

Within the User Input Section there are five subsections. As mentioned earlier, the given data is subdivided by type and each type is entered into a different subsection. The five subsections along with the type data entered are shown in Table VI.

The first subsection computes the promotion capability, PC(t), once the given data on losses, promotions to the next higher grade and net changes in DOPMA are entered in the appropriate spreadsheet cells. The following computation for PC(t) was discussed in detail in Chapter IV, Section G.

$$PC(t) = L(t) + P(t) + D(t-1,t)$$

This is the only actual computation made in the User Input Section. Once the PC(t) is calculated for FY(1) through FY(5) the values for PC(t) are transfered to other spreadsheet sections for further use.

The second subsection asks for the forecasted data obtained from the OFIP for AZ Cons and IZ Cons in each grade for FY(1) through FY(5). This data, when entered, is automatically transfered to another spreadsheet section for further calculations which will be explained later.

TABLE VI

GIVEN INPUT DATA AND PARAMETERS

Subsection	Data Input Type
1. Promotion Capability, PC(t)	Losses, L(t); Promotions, P(t); and DOPMA Authorizations, D(t-1,t).
2. Forecasted Data	AZ Cons for FY(t) and IZ Cons for FY(t).
3. Actual Board Data	AZ Cons & AZ Sel for FY(t); IZ Cons & IZ Sel for FY(t); and BZ Cons & BZ Sel for FY(t).
4. FY(-1) List Data	Number remaining on the list at the start of FY(0); Number of Years of AFCS; and List Expiration Date.
5. Promotion Parameters	AZ opportunity, $P(AZ \mid \overline{BZ} \cap \overline{IZ})$; IZ opportunity, $P(IZ \mid \overline{BZ})$; and BZ select % of list, p.

* Where t = 1,2,3,4,5.

The third subsection requires the results of the most recent promotion board for each grade. The actual numbers of officers considered and selected from all three promotion zones, AZ, IZ and BZ, are entered in this subsection. Again, no calculations are performed in this subsection but the data is transfered to another section for use in carrying out the promotion plan's logic.

The next subsection asks for the FY(-1) promotion list information for each grade. Entered in this subsection are three pieces of information. First, the number of officers

remaining to be promoted from the FY(-1) lists at the beginning of FY(0). Second, the years of AFCS of the last due course officer on the FY(-1) list. And finally the expiration date of each list. This data is obtained from the Promotions Branch of MILPERCEN as discussed in Chapter IV. No calculations are made in this subsection and data is only transfered to other sections.

The fifth and final subsection of the User Input Section requests the promotion parameters developed for each grade which represent promotion opportunity, $P(AZ|\overline{BZ}\cap\overline{IZ})$ and $P(IZ|\overline{BZ})$ respectively, as discussed in Section D of Chapter IV. Also entered is the DOPMA constraint, p, which limits the number of BZ selectees.

Before leaving the User Input Section it is worthwhile to amplify a key spreadsheet capability. Once all data and parameters have been entered and the results obtained, the force planner can play "What if?" games by merely changing the desired inputs. Spreadsheet technology allows for the immediate viewing of the effect those changes have on the Five Year Promotion Plan. By consolidating the inputs in one area of the spreadsheet, changes in data and parameters are quickly executed and through the automation of the Five Year Promotion Plan logic, reliable results are instantly obtained.

B. INDIVIDUAL GRADE PROMOTION SECTION

The second major section of the Five Year Promotion Plan Spreadsheet computes and displays, for all three grades, all of the results of interest to the force planner. This section is divided into three subsections. Each subsection uses the same mathematical logic and makes the same computations but to a different officer grade. The three subsections are labeled:

1. COL Prom Plan,
2. LTC Prom Plan and
3. MAJ Prom Plan.

The only differences among these three subsections are the values of the data entered in the Users Input Section and slight differences in the formulas. Since the mathematical logic and computations are similar, it is sufficient to discuss the first subsection, COL Prom Plan only. The same explanations are applicable to the other two subsections.

1. Calculating the Numbers Selected from the Above Zone, In Zone and Below Zone.

The COL Prom Plan is an abbreviated title for Colonel Promotion Plan. The outputs desired of the COL Prom Plan fall into one of two different categories. The first category of output deals with the number of LTC Sel from each of the three zones, AZ, IZ and BZ. The second category is concerned with promotion list forecasts such as list duration, list expiration date and the years of AFCS of the last due course officer on each list. Our discussion will begin with the first category of desired output.

As explained in Chapter IV, AZ Cons and IZ Cons is extracted from the OFIP. Also explained in Chapter IV was the development of promotion parameters for each grade and zone of consideration. Because the assumption is made that the promotion boards are given quotas to fill from the AZ and the IZ, these historically based parameters are applied to the number of officers being considered in order to forecast how many will be selected. To forecast the number of officers selected from the AZ category of officers for any FY(t), the following expression is used:

$$AZ\ Sel = AZ\ Cons \times P(AZ \mid \overline{BZ} \cap \overline{IZ}),$$

where,

AZ Sel = the number of officers selected for

promotion from the AZ;

AZ Cons = the number of officers considered for promotion from the AZ; and

$P(AZ|\overline{BZ} \cap \overline{IZ})$ = is the probability of being selected from the AZ given the officer was not selected from the BZ or IZ.

Likewise the number of officers selected from the IZ for any FY(t) is computed using similar logic:

$$IZ\ Sel = IZ\ Cons \times P(IZ|\overline{BZ}),$$

where,

IZ Sel = the number of officers selected for promotion from the IZ;

IZ Cons = the number of officers considered for promotion from the IZ; and

$P(IZ|\overline{BZ})$ = the probability of being selected from the IZ given the officer was not selected from the BZ.

Chapter IV developed the equation used to compute BZ Sel officers shown below. Since this is one equation with one unknown, BZ Sel computed is:

$$BZ\ Sel = \frac{(AZ\ Sel + IZ\ Sel)\ p}{1-p},$$

where,

BZ Sel = the number of officers selected for promotion from the BZ and

p = the percentage of BZ selectees as constrained by DOPMA.

These three results, AZ Sel, IZ Sel and BZ Sel, are summed to obtain the number of officers selected in total:

$$TOTAL\ Sel = AZ\ Sel + IZ\ Sel + BZ\ Sel,$$

where,

TOTAL Sel = the total number of officers selected

for promotion in a given grade.

Example: Given AZ Cons = 942, IZ Cons = 969, p = 10%, $P(AZ|\overline{BZ}\cap\overline{IZ})$ = .04 and $P(IZ|\overline{BZ})$ = .47, the number selected for promotion from each promotion zone is:

$$\text{AZ Sel} = 942 \times .04 = 38$$

$$\text{IZ Sel} = 969 \times .47 = 455$$

$$\text{BZ Sel} = \frac{(38 + 455)\ .1}{1-.1} = 54 \text{ and}$$

$$\text{TOTAL Sel} = 38 + 455 + 54 = 547\ .$$

These calculations are repeated for each FY(1) through FY(5) and displayed in the COL Prom Plan subsection. The LTC and MAJ promotion plan calculations are similarly displayed in the appropriate subsections.

2. Calculating List Duration.

Now that the total number of officers, TOTAL Sel, on the promotion list is known, attention may be focused on the other category of outputs which are of interest to the force planner. First the calculation of the list duration is examined. Once the list duration calculation is accomplished the other outputs of interest, namely the list expiration date and the years of AFCS of the last due course officer on the promotion list are easily computed.

The term "list duration" refers to the elapsed time from the date the first (most senior) officer on the promotion list is promoted to the date the last (most junior) officer on the promotion list is promoted. List duration is expressed in terms of total months. It is worthwhile to note that the time between the date the officers on a promotion list were selected and the date the first officer on that list is promoted is not included in the list duration. The only time counted is the time it takes to exhaust the list once the first promotion from the list has occurred.

In order to calculate the list duration, two items of information must be known. The first item, already calculated, is the total number of officers selected by the promotion board, TOTAL Sel. The second item of information deals with the rate at which the officers selected will be promoted. Here we make the assumption that the number of officers being promoted to the next higher grade is constant each month throughout the FY. Since we have already calculated PC(t), the total number of promotions to the next higher grade forecasted to occur in FY(t), the monthly promotion rate for FY(t) is calculated using the expression:

$$PR(t) = PC(t) \div 12,$$

where PR(t) stands for the number to be promoted monthly for a specific grade during FY(t).

It is obvious from the above expression that PR(t) will change from year to year because PC(t) will change from year to year. This means that the forecasted rate at which officers in the promotion queue will be promoted changes at the beginning of each FY and remains constant until the start of the next FY.

In the simplest case, when a promotion list is started and finished within the same FY there is only a single monthly promotion rate, PR(t). In this case the number of months it takes to exhaust the promotion list is given as:

$$\text{List Duration} = \text{TOTAL Sel} \div PR(t),$$

where List Duration means the number of months it takes to exhaust the promotion list once the first officer on that list is promoted.

More frequently, however, the promotion list spans the start of two FY's. In this case different promotion rates must be applied to the number of officers remaining to

be promoted during each of the two FY's involved. The starting point for this computation is to figure out how many officers on the promotion list can be promoted during FY(t) where FY(t) stands for the first year in which promotions from this list occur. The difference between the promotion capability, PC(t), and the number of officers who were promoted from the previous promotion list (denoted by PL) gives the number of promotions available in FY(t) from the new promotion list.

Therefore, if

CP(t) = the number of officers on the new promotion list that can be promoted in FY(t) and

PL = the number of officers on the previous promotion list who were promoted during FY(t),

then

$$CP(t) = PC(t) - PL.$$

Since CP(t) is the number of officers from the new promotion list to be promoted in FY(t), dividing CP(t) by PR(t), the number of months in FY(t) in which officers will be promoted from the new promotion list is obtained:

$$\text{Months Used in FY(t)} = CP(t) \div PR(t).$$

Next we must determine how many officers remain to be promoted from the promotion list at the start of the next fiscal year, FY(t+1). By subtracting the number of officers promoted in FY(t) from the TOTAL Sel, we are left with the number of "officers remaining" (OR) to be promoted in FY(t+1):

$$OR(t+1) = \text{TOTAL Sel}(t) - CP(t),$$

where OR(t+1) is the number of officers on the promotion list who remain to be promoted in FY(t+1).

As mentioned earlier, the year FY(t+1) has a new promotion rate, PR(t+1). By dividing the number of officers, OR(t+1), on the promotion list who remain to be promoted, by the new rate, PR(t+1), the number of months in FY(t+1) that are used to exhaust the promotion list is determined:

$$\text{Months Used in FY}(t+1) = \text{OR}(t+1) \div \text{PR}(t+1).$$

By combining the number of months used in FY(t) and the number of months used in FY(t+1), the total list duration is obtained:

$$\text{List Duration} = \text{Months Used in FY}(t) + \text{Months Use in FY}(t+1).$$

Occasionally a promotion list will span the start of three FY's thus requiring the application of three different promotion rates. The same logic is used to compute the number of months used in FY(t) as discussed above. When the number of OR(t+1) is greater than the PC(t+1) then the full 12 months of FY(t+1) will be used in promoting officers on the promotion list and there will still be OR(t+2) officers remaining at the beginning of FY(t+2). The number, OR(t+2), is calculated using the following expression:

$$\text{OR}(t+2) = \text{OR}(t+1) - \text{PC}(t+1),$$

where OR(t+2) is the number of officers on the promotion list who remain to be promoted at the beginning of FY(t+2).

The number of months used in FY(t+2) to exhaust the promotion list is calculated by dividing the number, OR(t+2), by PR(t+2):

$$\text{Months Used in FY}(t+2) = \text{OR}(t+2) \div \text{PR}(t+2).$$

Now the list duration is calculated by adding the number of months used in each of the three FY's:

List Duration = Months Used in FY(t)
+ Months Used in FY(t+1)
+ Months Used in FY(t+2)

or

List Duration = Months Used in FY(t)
+ 12
+ Months Used in FY(t+2).

Once a promotion list is exhausted the next promotion list in the promotion queue is activated and calculations on its duration are started. Each promotion list is handled separately in its turn. The same logic is applied to each when forecasting the list duration.

3. Calculating the List Expiration Date.

Having calculated the forecasted list duration, determining the forecasted list expiration date is relatively straight forward. The list expiration date is the calendar date that the last (most junior) officer on the promotion list gets promoted. One of the items of information given to the force planner by the Promotions Branch at MILPERCEN is the expiration date of the FY(-1) promotion list. This given date can be an actual date or a forecasted date based on the most recent promotion estimates. In either case, the date is assumed to be actual and serves as the starting point for forecasting the list expiration dates for the years FY(0) through FY(5).

Armed with the forecasted list durations for the promotion lists of years FY(0) through FY(5), the expiration dates for these lists are calculated using simple calendar arithmetic. Adding the list duration of the FY(0) promotion list to the FY(-1) list expiration date obtained from the Promotions Branch at MILPERCEN produces the forecasted FY(0) promotion list expiration date. Next, the FY(1) list

duration is added to the newly computed FY(0) list expiration date to get the forecasted FY(1) list expiration date and so on through FY(5). Mathematically this is expressed as:

FY(t) List Expiration Date = FY(t-1) List Expiration Date + FY(t) List Duration,

for t= 0,1,2,3,4,5, where the Expiration Dates are expressed as calendar dates, the List Duration is expressed in months and the addition is performed in calendar arithmetic.

The known reference point, the expiration date for the FY(-1) promotion list, serves as the foundation for all subsequent forecasts.

4. Calculating the Years of Active Federal Commissioned Service.

The years of AFCS of the last due course officer on a promotion list at the time of his promotion, as explained in Section C of Chapter IV, is calculated in a similar fashion as the promotion list expiration dates.

Promotion boards are held annually (every 12 months), and when the promotion list duration is 12 months, there is no change in the years of AFCS from one YG to the next, as 12 - 12 = 0. It follows then that if the list duration is greater than or less than 12 months, the years of AFCS from one YG to the next will increase or decrease by the net difference between the list duration and 12 months. To determine the net change in years of AFCS from one year to the next the following expression is used:

Net Change in Years of AFCS = FY(t) List Duration - 12, for, t = 0,1,2,3,4,5.

The Promotions Branch at MILPERCEN once again provides the starting point from which to forecast the years

of AFCS of the last due course officer on each promotion list. Knowing the years of AFCS of the most junior officer on the FY(-1) list and having already computed the forecasted list durations for the promotion lists FY(0) through FY(5), the forecasted years of AFCS can be calculated:

$$\text{Years of AFCS for FY(t)} = \text{Years of AFCS for FY(t-1)} + (\text{FY(t) List Duration} - 12),$$

for t = 0,1,2,3,4,5, where the years of AFCS is expressed in years and months and list duration is expressed in months.

This way, forecasts for the number of years of AFCS for years FY(1) through FY(5) are calculated in turn using the above formula.

This concludes all of the calculations and information found in the Individual Grade Promotion Section of the Five Year Promotion Plan spreadsheet. As mentioned at the beginning of this chapter, this section contains the bulk of the information force planners are interested in forecasting, namely it provides the detailed information on each of the three officer grades.

C. THE YEAR AND MONTH ACCOUNTING SECTION AND THE FIVE YEAR PROMOTION SECTION.

The last two major sections of the Five Year Promotion Plan Spreadsheet are the Year and Month Accounting Section and the Five Year Promotion Plan Section.

The Year and Month Accounting Section is the area of the spreadsheet that actually computes the list durations, list expiration dates and the years of AFCS for all grades and all promotion lists. This subsection of the spread sheet serves no useful purpose to the user and can be totally ignored when viewing the spreadsheet outputs. On the other hand, a future programmer wishing to review or alter the

spreadsheet logic and calculations would be most interested in this subsection. The outputs of these calculations are displayed in the appropriate grade subsection of the Individual Grade Promotion Section. The calculations are consolidated at the bottom area of the spreadsheet so that the other sections should appear less cluttered.

The Five Year promotion Plan Section is designed to display in a consolidated and concise format all of the outputs of interest to the force planner. No calculations occur in that section. The data displayed is calculated in the Individual Grade Promotion Section and the Year and Month Accounting Section and simply transfered to this section to facilitate viewing by the force planner.

VI. SPREADSHEET DEMONSTRATION

The intent of this chapter is to provide step-by-step user friendly instructions on the operation of the Five Year Field Grade Officer Promotion Plan Spreadsheet. The way this will be accomplished is as follows. First a written explanation on what the user is to do is presented. The explanation is then followed by what the computer monitor display should look like if the user made the correct entries.

In order to minimize any confusion two assumptions are initially made. The first assumption is that the user has collected all the given data from the OFIP and the Promotions Branch at MILPERCEN as outlined in Chapters IV and V.

For demonstration purposes let us assume that the task is to produce the Five Year Field Grade Officer Promotion Plan. The date is 10 September 1984 so the current board year is FY 1984 while the first promotion year is FY 1985. We have extracted the following data from the 4 September 1984 OFIP, requested and received the necessary data from the Promotions Branch at MILPERCEN. The data for all three grades are summarized in Tables VII, VIII and IX and the given promotion parameters are found in Table X. The data in these four Tables will be used as inputs for this demonstration.

The second assumption concerns the equipment that must be available to the user. It is assumed that the following equipment is on hand, properly connected and fully operational with power applied:

1. Microcomputer with monitor, two disk drives, keyboard and printer; e.g. IBM PC with at least a 128K memory;

2. LOTUS 1-2-3 software package with systems diskette, graphics diskette; and a Disk Operating System, such as IBM DOS 2.0; and
3. Diskette containing the Five Year Field Grade Officer Promotion Plan Spreadsheet, abbreviated by the file name "PRO_PLAN", produced in conjunction with this thesis.

TABLE VII
COLONEL PROMOTION INPUTS

COLONEL

Promotion Year	1985	1986	1987	1988	1989	1990	
L(t)	559	425	487	484	491	476	
P(t)	50	50	50	50	50	50	
D(t-1,t)	-166	65	0	0	0	0	
Board Year	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**
AZ Cons	---	1265	942	917	839	888	1141
AZ Sel	---	45	---	---	---	---	---
IZ Cons	---	991	969	830	1067	1421	1134
IZ Sel	---	485	---	---	---	---	---
BZ Cons	---	2239	---	---	---	---	---
BZ Sel	---	58	---	---	---	---	---
FY(-1) PL	124						
AFCS	22 Yrs 3 Mos						
Exp Date	Dec 84						

START HERE:

The beginning status of the equipment is assumed to be at the "A>" on the computer monitor, as seen in Figure 6.1.

TABLE VIII

LIEUTENANT COLONEL PROMOTION DATA INPUTS

LIEUTENANT COLONEL

Promotion Year	1985	1986	1987	1988	1989	1990	
L(t)	890	918	1149	1145	1165	1213	
D(t-1,t)	123	41	0	0	0	0	
Board Year	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**
AZ Cons	---	1551	1464	1701	1486	1186	902
AZ Sel	---	239	---	---	---	---	----
IZ Cons	---	2268	2528	1822	1601	1615	1733
IZ Sel	---	1609	---	---	----	----	----
BZ Cons	---	2113	---	---	----	----	----
BZ Sel	---	79	---	---	----	----	----
FY(-1) PL	1372						
AFCS	16 Yrs 9 Mos						
Exp Date	Aug 85						

The following steps are to be followed in sequence to produce the Five Year Promotion Plan using the Promotion Plan Spreadsheet.

STEP 1:

Insert the LOTUS 1-2-3 System diskette into Drive A and close the Drive A latch. Next, type "lotus". The monitor should appear as shown in Figure 6.2.

Press the "Enter" key. (On the IBM keyboard the enter key is denoted by the symbol "↵".) The monitor display should look like Figure 6.3.

STEP 2:

Near the top of the display is the command choice menu. Make sure that the cursor highlights the command choice

TABLE IX

MAJOR PROMOTION DATA INPUTS

MAJOR

Promotion Year	1985	1986	1987	1988	1989	1990
L(t)	641	628	656	636	603	573
D(t-1,t)	160	146	0	0	0	0

Board Year	1983	1984	1985	1986	1987	1988	1989
AZ Cons	---	708	775	642	649	734	993
AZ Sel	---	144	---	---	---	---	----
IZ Cons	---	2161	2158	2616	2973	3293	3180
IZ Sel	---	1686	---	---	----	----	----
BZ Cons	---	2282	---	---	----	----	----
BZ Sel	---	30	---	---	----	----	----

FY(-1) PL	820
AFCS	11 Yrs 4 Mos
Exp Date	Jan 85

TABLE X

PROMOTION PARAMETERS INPUTS

PROMOTION PARAMETERS	COL	LTC	MAJ
AZ Sel Opportunity	.04	.13	.19
IZ Sel Opportunity	.47	.67	.75
BZ Sel % of List	.10	.10	.05

"1-2-3" which is located at the far left. If it is not already highlighted use the "arrow" keys to move the cursor

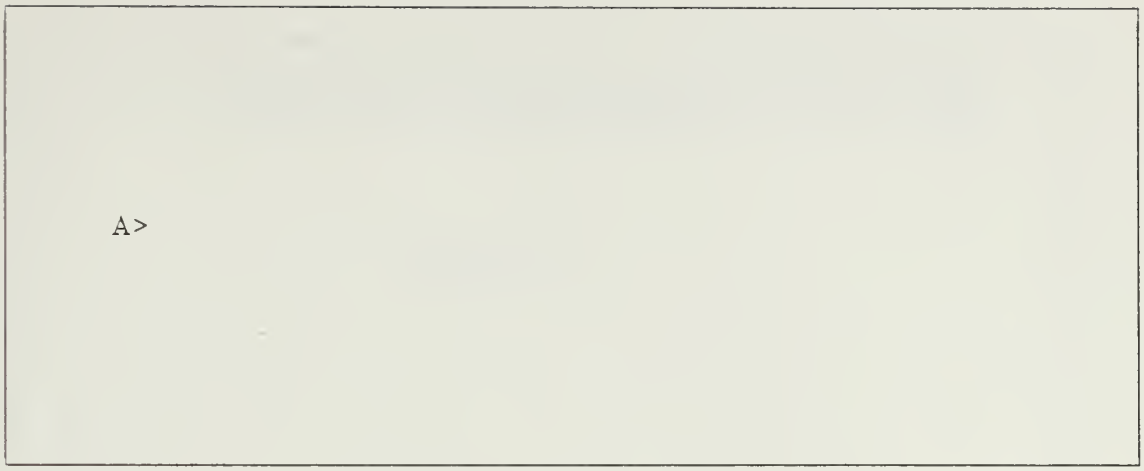


Figure 6.1 Monitor Display at the Start of the Demonstration.

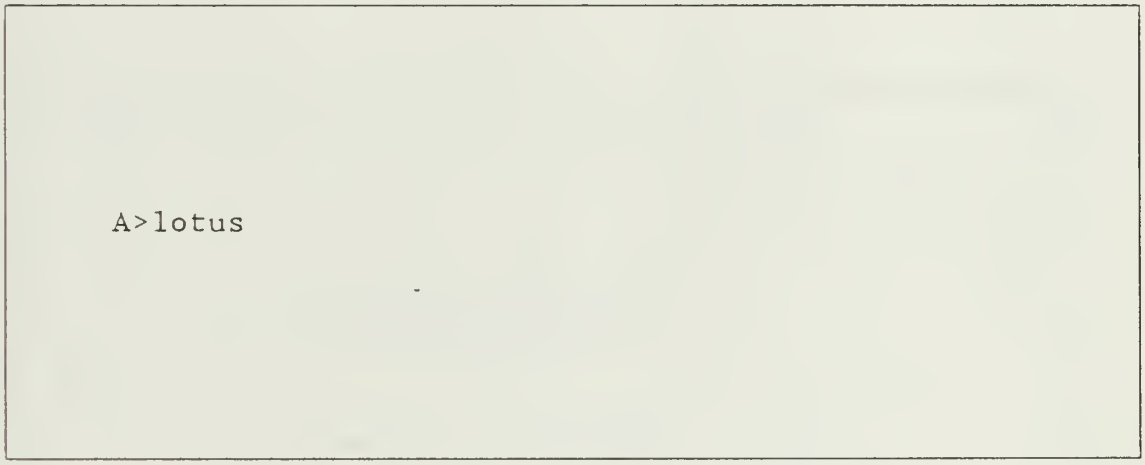


Figure 6.2 Monitor Display at the Start of STEP 1.

so that it highlights 1-2-3, then press "Enter". The monitor display should look like Figure 6.4.

STEP 3:

Do as the display instructs. "Press Any Key To Continue". The monitor should display an empty spreadsheet matrix like Figure 6.5.

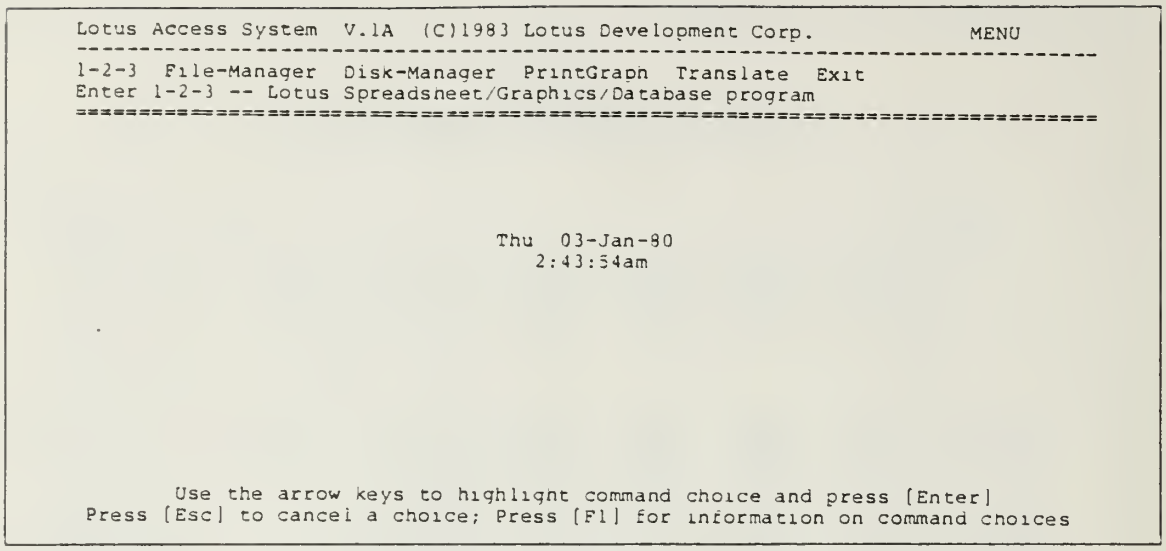

Lotus Access System V.1A (C)1983 Lotus Development Corp. MENU
1-2-3 File-Manager Disk-Manager PrintGraph Translate Exit
Enter 1-2-3 -- Lotus Spreadsheet/Graphics/Database program
Thu 03-Jan-80
2:43:54am
Use the arrow keys to highlight command choice and press [Enter]
Press [Esc] to cancel a choice; Press [F1] for information on command choices

Figure 6.3 Monitor Display at the End of STEP 1.

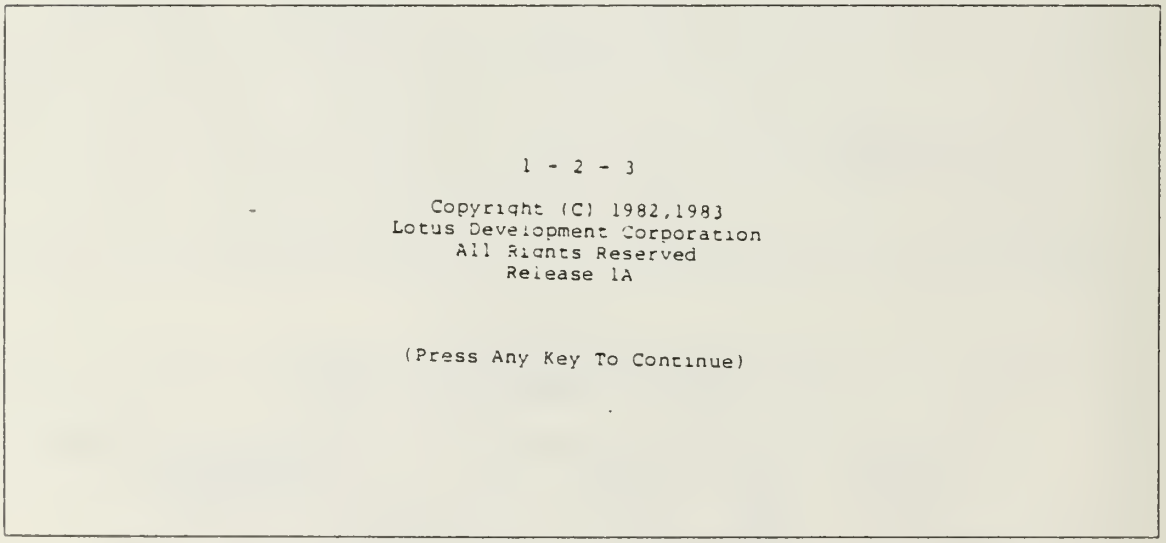


Figure 6.4 Monitor Display at the End of STEP 2.

STEP 4:

Press the "/" key located to the right on the bottom row of the keyboard. The monitor should look like Figure 6.6.

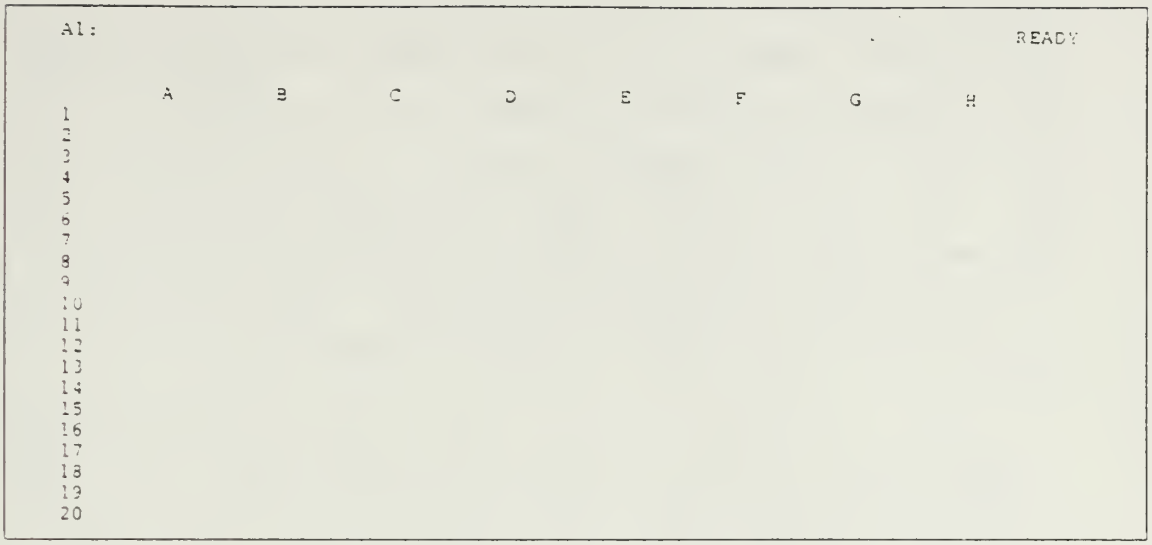


Figure 6.5 Monitor Display at the End of STEP 3.

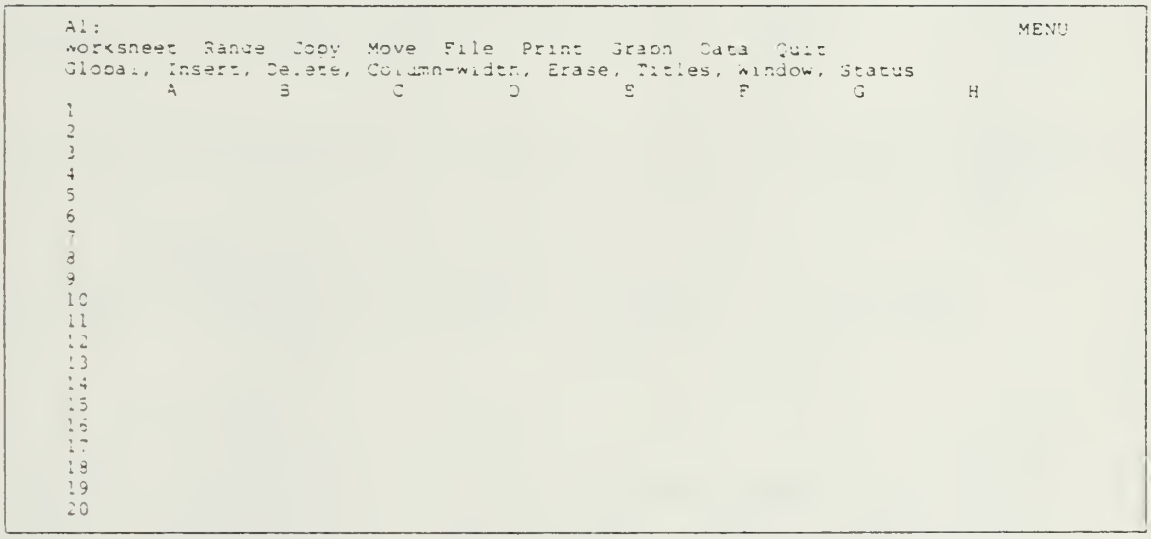


Figure 6.6 Monitor Display at the End of STEP 4.

STEP 5:

Note: At the top of the monitor is displayed the command choice menu. There are two ways to invoke a command

choice. Either, by moving the cursor so that it highlights the desired command choice and then pressing the "Enter" key or by merely pressing the key of the capitalized letter at the start of each command choice. This demonstration will use the second method when giving instructions to you, however, either way can be used to get the job done.

The command choice we want is "File" so press the "F" key and the menu should change to Figure 6.7.

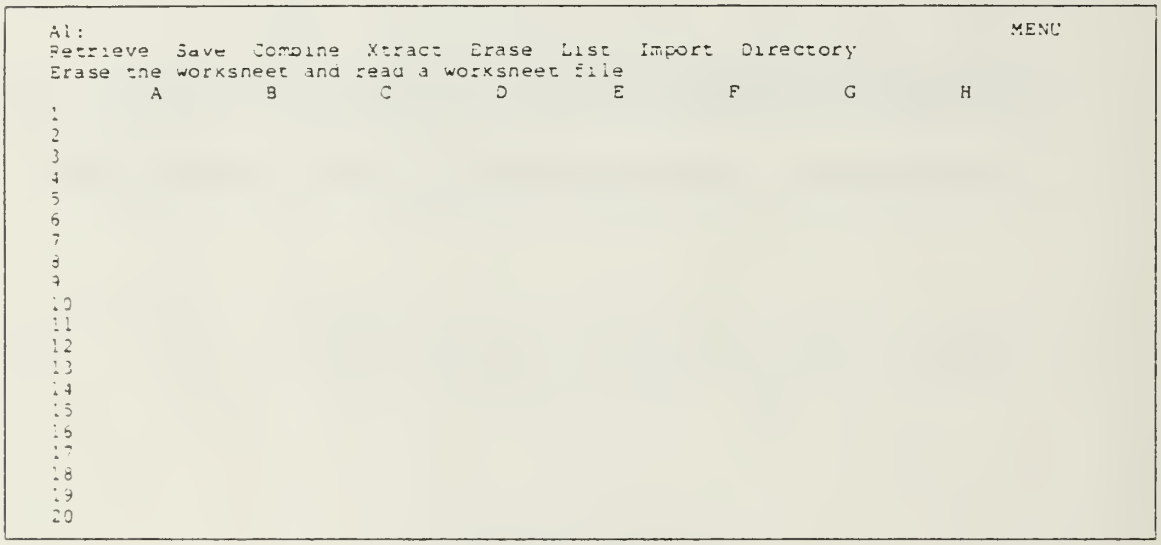


Figure 6.7 Monitor Display at the End of STEP 5.

STEP 6:

At this time insert the diskette containing the Five Year Promotion Plan Spreadsheet into the B-Drive and close the latch. Next the command choice we want to invoke is the "Retrieve" command. Press the "R" key and the monitor display should look like Figure 6.8.

STEP 7:

The abbreviated file name for the Five Year Promotion Plan Spreadsheet is "PRO_PLAN". If necessary, move the

```
A1:                                                              MENU
Enter name of file to retrieve:
PRO_PLAN  1984PLAN
        A         B         C         D         E         F         G         H
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
```

Figure 6.8 Monitor Display at the End of STEP 6.

cursor so that it highlights the file name "PRO_PLAN". Once this is done press the "Enter" key. Figure 6.9 should be displayed on the monitor.

```
A1: "USER INPUT SECTION                                                  READY

        A                B      C    D      E      F      G      H      I
1    USER INPUT SECTION
2          ENTER PC DATA HERE:   PROM YR        0              1              2
3   COL VACANCIES:
4              + Losses =                      0              0              0
5           - Pro to BG =                      0              0              0
6             + - DOPMA =                      0              0              0
7              ----------                   -----          -----          -----
8                COL PC =                      0              0              0
9   LTC VACANCIES:
10             + Losses =                      0              0              0
11          - Pro to COL =                     0              0              0
12            + - DOPMA =                      0              0              0
13             ----------                   -----          -----          -----
14               LTC PC =                      0              0              0
15  MAJ VACANCIES:
16             + Losses =                      0              0              0
17          - Pro to LTC =                     0              0              0
18            + - DOPMA =                      0              0              0
19             ----------                   -----          -----          -----
20               MAJ PC =                      0              0              0
                                                                      CAPS
```

Figure 6.9 Monitor Display at the End of STEP 7.

STEP 8:

The PRO_PLAN spreadsheet should appear with the words "USER INPUT SECTION" at the upper left corner of the monitor. If this is not the case press the "Home" key on the keyboard and the words "USER INPUT SECTION" should appear at the upper left corner of the monitor.

STEP 9:

Note: The spreadsheet has both protected and unprotected cells. This method guards the spreadsheet logic and formulas from being inadvertly changed. A protected cell is one that prohibits the operator from changing what is already in the cell while an unprotected cell is a cell which will accept data when entered. The unprotected cells appear highlighted on a black and white monitor or tinted green on a color monitor. It is only in these highlighted or green tinted unprotected cells that you can enter data into the spreadsheet. If the operator tries to enter data in a protected cell the computer will give a loud buzz, the keyboard will lockup and the lower left corner of the monitor will display the words "Protected Cell". If this happens just press the "ESC" key located to the left on the top row of the keyboard to free the keyboard and continue.

Before proceeding, become familiar with the layout of the entire spreadsheet. Quickly refer to Figure 5.1 from Chapter V which shows the relative positioning of the four major sections which make up the Promotion Plan Spreadsheet. The operator can view each of these sections by scrolling the monitor display to the left, right, up or down using the "arrow" keys or the "Pg Up" and "Pg Dn" keys. After this familiarization with the Promotion Plan Spreadsheet layout press the "Home" key to return to the User Input Section.

Since the necessary data (see Tables VII through X), has been collected, the data can now be entered in the appropriate cells. Start by first entering the data for promotion to colonel.

STEP 10:

Move the cursor to cell E2. (The user can verify which cell the cursor is in by looking at the top left corner of the monitor. The cell location of the cursor is always displayed in this corner.) Type the last two digits of the first promotion year of the Five Year Promotion Plan being developed, i.e. if the first promotion year is "1985" type "85" and press "Enter". As can be seen, all of the subsequent dates have been automatically calculated and the monitor screen should look like Figure 6.10.

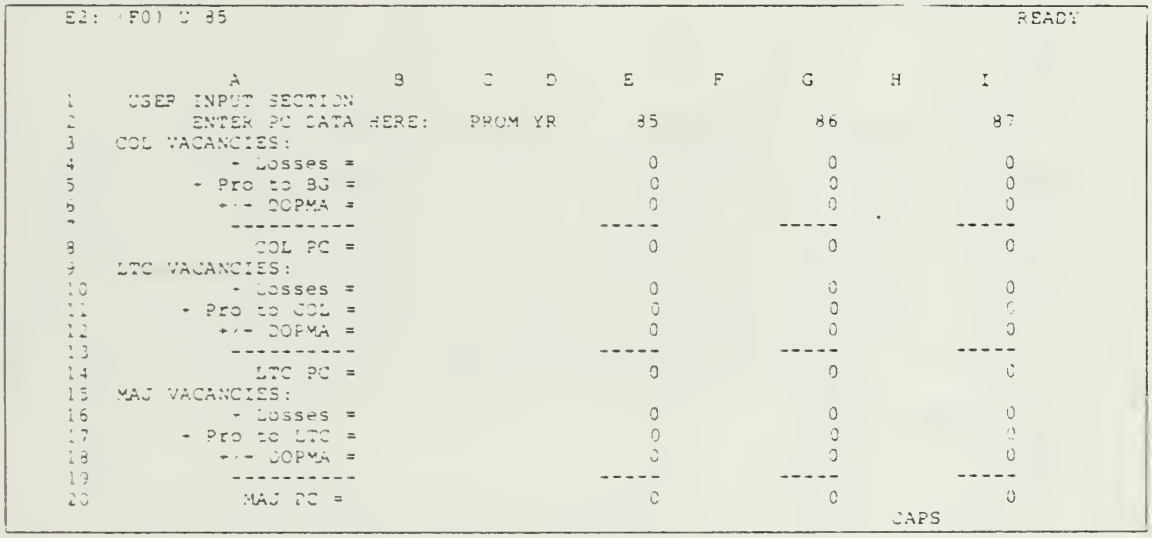

E2: '85
READY
A B C D E F G H I
1 USER INPUT SECTION
2 ENTER PC DATA HERE: PROM YR 85 86 87
3 COL VACANCIES:
4 - Losses = 0 0 0
5 - Pro to BG = 0 0 0
6 +/- DOPMA = 0 0 0
7 ---------- ----- ----- -----
8 COL PC = 0 0 0
9 LTC VACANCIES:
10 - Losses = 0 0 0
11 - Pro to COL = 0 0 0
12 +/- DOPMA = 0 0 0
13 ---------- ----- ----- -----
14 LTC PC = 0 0 0
15 MAJ VACANCIES:
16 - Losses = 0 0 0
17 - Pro to LTC = 0 0 0
18 +/- DOPMA = 0 0 0
19 ---------- ----- ----- -----
20 MAJ PC = 0 0 0
CAPS

Figure 6.10 Monitor Display at the End of STEP 10.

STEP 11:

The values needed to compute the Promotion Capability, PC(t), for the grade of COL are entered next. These values

include Losses,L(t); Promotions to BG, P(t); and changes in DOPMA, D(t-1,t). First, move the cursor to cell E4. Type in the values for L(1) which is the number 559 from Table 6-1 and press "Enter". Likewise, by moving the cursor laterally to the right using the "arrow" keys, enter the successive values for L(t) for t = 2,3,4,5,6. After entering all values for L(t) for the grade of COL press the "Home" key.

STEP 12:

The values representing promotions to the next higher grade, P(t), are entered next. Place the cursor in cell E5. Type the value for P(1), which is the number 50 and press "Enter". Moving the cursor laterally to the right, enter successive values for P(t) when t = 2,3,4,5,6. After entering all the values for P(t) for the grade of COL press the "Home" key.

STEP 13:

The values representing the net change in DOPMA Authorizations, D(t-1,t), are entered next. Place the cursor in cell E6. Type the value for D(0,1), which is the number -166 and press "Enter". Moving the cursor laterally to the right, enter successive values for P(t) when t= 2,3,4,5. After entering all the values for D(t-1,t) press the "Home" key.

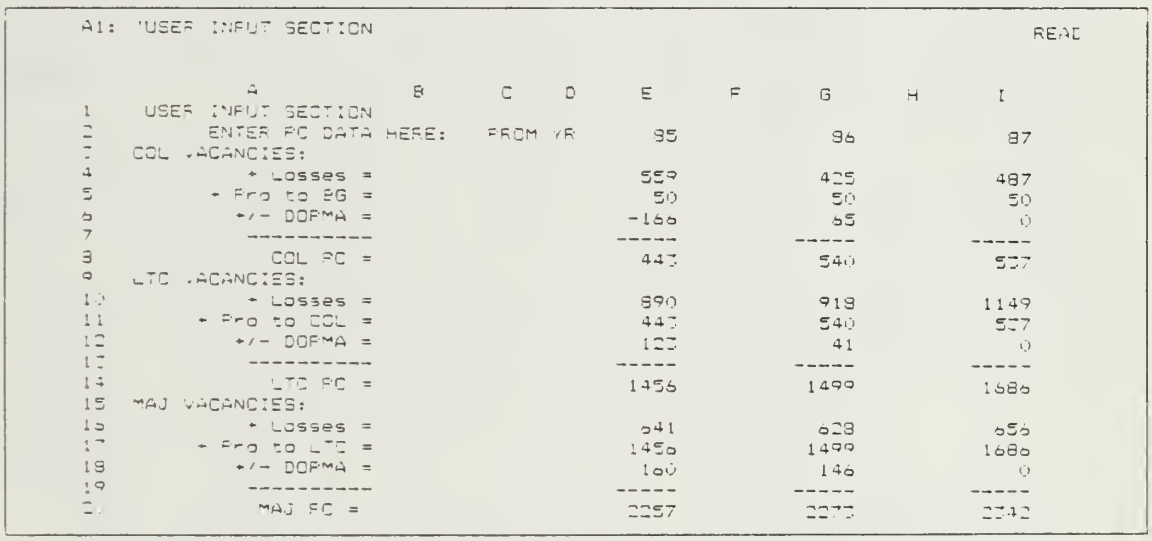
STEP 14:

Note: The spreadsheet automatically calculates the promotion capability for the grade of colonel, COL PC, for each promotion year. As noted in Chapter IV Section G the COL PC(t) becomes the P(t) for LTC. For this reason, when entering the data for LTC vacancies, the values for P(t) have already been entered, so the only entries to make are the L(t) and D(t-1,t). These values are entered in the

appropriate cells following the same procedures as outlined above for the grade of COL. Enter these values from Table VIII for the grade of LTC and press the "Home" key when finished.

STEP 15:

What was said in STEP 14 for the grade of LTC is also applicable for the grade of MAJ. Therefore, the LTC PC(t) becomes the MAJ P(t) and is automatically computed and entered in the appropriate cells. The only values to enter here are the L(t) and D(t-1,t) for the grade of MAJ. Enter these values from Table IX. This completes the data entries in the Promotion Capability subsection. Press the "Home" key and the left hand portion of the PC subsection should look like Figure 6.11.



A1: 'USER INPUT SECTION								READ
	A	B	C	D	E	F	G	H	I
1	USER INPUT SECTION								
2	ENTER PC DATA HERE:		FROM YR		85		86		87
3	COL VACANCIES:								
4	+ Losses =				559		425		487
5	+ Pro to BG =				50		50		50
6	+/- DOPMA =				-166		65		0
7	----------				-----		-----		-----
8	COL PC =				443		540		537
9	LTC VACANCIES:								
10	+ Losses =				890		918		1149
11	+ Pro to COL =				443		540		537
12	+/- DOPMA =				123		41		0
13	----------				-----		-----		-----
14	LTC PC =				1456		1499		1686
15	MAJ VACANCIES:								
16	+ Losses =				841		828		856
17	+ Pro to LTC =				1456		1499		1686
18	+/- DOPMA =				160		146		0
19	----------				-----		-----		-----
20	MAJ PC =				2257		2273		2542

Figure 6.11 Monitor Display at the End of STEP 15.

STEP 16:

Scroll the monitor until the cell A21 is at the top left corner of the monitor. Within view are the next two

subsections of the Promotion Plan Spreadsheet. The first subsection is where the user will enter the forecasted AZ Cons and IZ Cons from Tables VII, VIII and IX for each grade during each board year. Enter this data into the subsection by placing the cursor in the appropriate cell and typing the correct value for that grade and board year then press "Enter". Continue until all values are correctly entered for board years 1985 through 1989. Return to cell A21 as the upper left cell displayed on the monitor when finished.

STEP 17:

Next enter the actual board data received from the Promotions Branch at MILPERCEN. Enter the board year 1984 AZ Cons, AZ Sel, IZ Cons, IZ Sel, BZ Cons and BZ Sel found in Tables VII, VIII, and IX for each of the three grades in their appropriate cells. When finished scroll the monitor screen so that cell A21 is at the upper left corner of the monitor screen. The monitor should show both completed subsections looking like Figure 6. 12.

```
A21: ----------                                                    READ.

        A              B      C    D      E        F      G        H      I
21  ------------------------------------------------------------------------
22    ENTER FORECASTED                        ACTUAL
23      DATA HERE :              BOARD YR       84              85            86
24        COL AZ CONS =                         N/A             942           917
25        COL IZ CONS =                         N/A             969           830
26        LTC AZ CONS =                         N/A            1464          1701
27        LTC IZ CONS =                         N/A            2328          1822
28        MAJ AZ CONS =                         N/A             775           642
29        MAJ IZ CONS =                         N/A            2158          2616
30  ------------------------------------------------------------------------
31    ENTER ACTUAL BOARD     FY      84
32      DATA HERE :                 COL          LTC           MAJ
33            AZ CONS =            1265         1551           708
34              AZ SEL =             45          239           144
35            IZ CONS =             991         2268          2161
36              IZ SEL =            485         1609          1686
37            BZ CONS =            2239         2113          2292
38              BZ SEL =            38           79            30
39  ------------------------------------------------------------------------
40    ENTER FY(-1) LIST      FY      83
                                                                  CAPS
```

Figure 6.12 Monitor Display at the End of STEP 17.

STEP 18:

The FY(-1) list data obtained from the Promotions Branch at MILPERCEN is entered in this final subsection. Enter the number of officers remaining to be promoted, PL, from the FY(-1) list for all three grades in cells C42, E42 and G42 as appropriate. This data is listed in the lower portions of each of the Tables VII through IX. Next, enter the number of (years, months) of AFCS of the last due course officer on the FY(-1) list in cells (C44,D44), (E44,F44) and (G44,H44) as appropriate.

STEP 19:

The list expiration dates in this subsection are displayed in calendar month and year format, e.g. Dec 84. However, this is not the format the information is entered into the spreadsheet. The format that the expiration date is entered into the computer is "@DATE(YY,MM,DD)". For example, 1 December 1984 is entered by typing "@DATE(84,12,01)" then pressing the "Enter" key. Enter the list expiration dates, which are the last items listed in Tables VII, VIII and IX, for all three grades in cells C45, E45 and G45 as appropriate using the format just explained. (Always enter 01 for the calendar days.) The spreadsheet converts the @DATE(YY,MM,DD) format into a calendar month and year when outputs are displayed.

STEP 20:

The final value entered into the spreadsheet is the month number of the FY(-1) list expiration date for each of the three grades. Use Table XI to determine the month numbers then enter the numbers into cells D46, F46 and H46, as appropriate. For example, if the FY(-1) COL promotion list expired in December 1984 then enter the number 3 in cell D46. If the FY(-1) LTC promotion list expires in August 1985 enter 11 in cell F46, and so on.

TABLE XI

MONTH CONVERSION TABLE

Month	Exp Mo in the FY #	Month	Exp Mo in the FY #
October	1	April	7
November	2	May	8
December	3	June	9
January	4	July	10
February	5	August	11
March	6	September	12

STEP 21:

The final entries to make are the promotion parameters for each grade. Enter the selection opportunity for each grade from Table X in the appropriate cell of the Promotion Parameter subsection. Once this is complete make sure cell A39 is in the upper left corner of the monitor then compare your monitor screen to Figure 6.13. They should be the same.

STEP 22:

All data is now entered and the results can be viewed in either one of two different sections of the Promotion Plan Spreadsheet.

Scroll the monitor until cell U1 is in the upper left corner of the monitor. In view is the top half of the 5-YR Promotion Plan Section. (By pressing the "Pg Dn" key the lower half can be viewed.) All outputs of interest are consolidated in this spreadsheet section. The monitor should look like Figure 6.14.

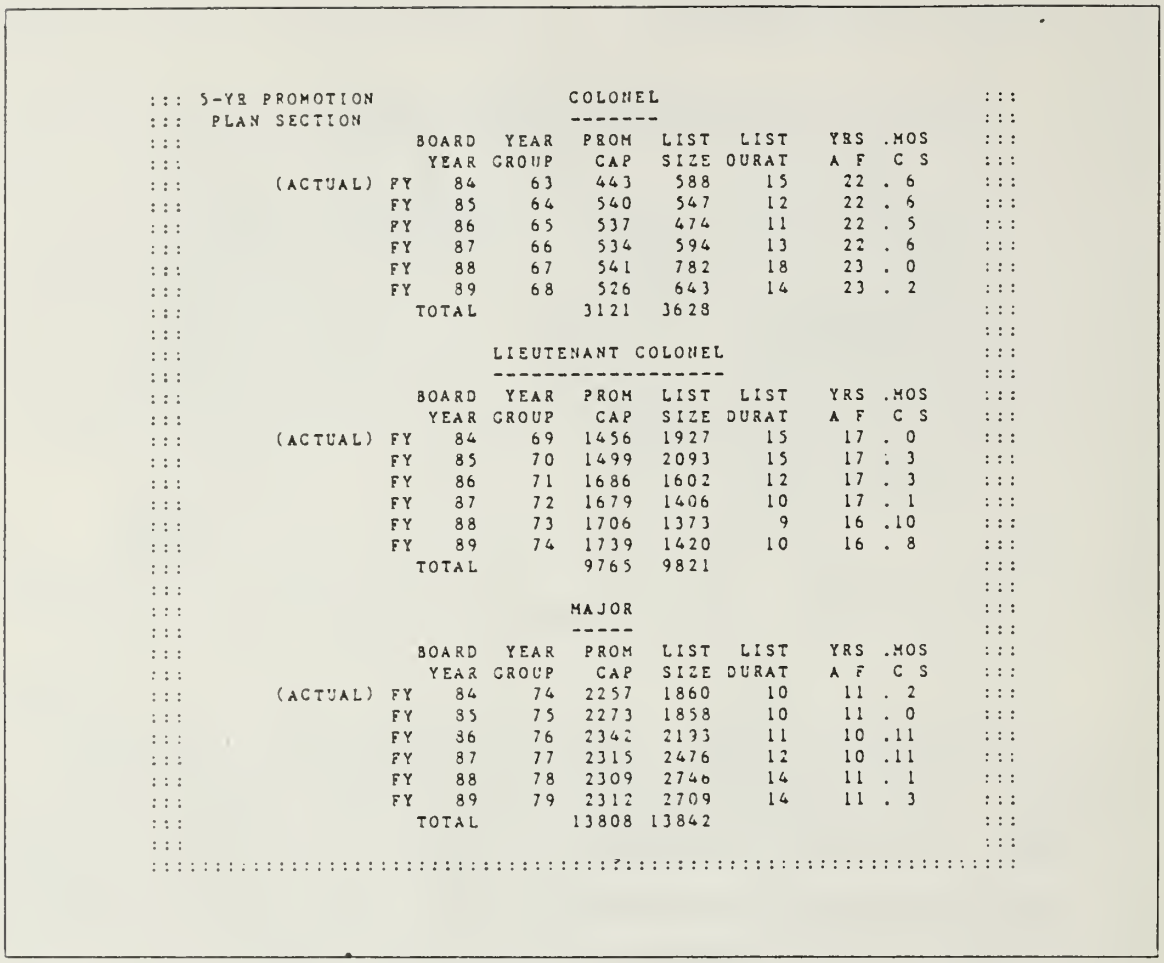
```
A39: '--------------------                                                      READY

                  A            B       C    D     E       F       G       H       I
39  ------------------------------------------------------------------------------------
40   ENTER FY(-1) LIST      FY      83
41      DATA HERE :                     COL          LTC               MAJ
42      PREVIOUS LIST =             124         1372             820
43                                  YRS MOS      YRS     MOS     YRS     MOS
44               AFCS =              22   3       16       9      11       4
45      LIST EXP DATE =          Dec-84     Aug-85          Jan-85
46  EXP MO # in the FY =                  3               11               4
47  ------------------------------------------------------------------------------------
48    ENTER PROMOTION
49   PARAMETERS HERE :              COL                  LTC             MAJ
50  AZ SEL OPPORTUNITY =           0.04                 0.13            0.19
51  IZ SEL OPPORTUNITY =           0.47                 0.67            0.75
52   BZ SEL % OF LIST =            0.10                 0.10            0.05
53
54  NO INPUTS BELOW THIS LINE
55  ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
56    INDIVIDUAL GRADE
57   PROMOTION SECTION
58
                                                                       CAPS
```

Figure 6.13 Monitor Display at the End of STEP 21.

The other section which displays these same results is the Individual Grade Promotion Section. Scroll until cell A56 is in the upper left corner of the monitor. This is the start of the COL PROM PLAN subsection. The same information contained in the 5-Yr Promotion Plan Section is located here as well as the forecasted values of AZ Sel, IZ Sel and BZ Sel for each board year. Further down the spreadsheet is located the LTC PROM PLAN and the MAJ PROM PLAN subsections which also contain the detailed promotion plan results.

STEP 23: <u>How to Save and/or Exit the Spreadsheet</u>.

This completes the production of the Five Year Field Grade Officer Promotion Plan. All of the work just completed can be saved (recorded) on the diskette containing the Five Year Promotion Plan Spreadsheet and be recalled for future use or reference. If the user wants to save the work just done and then exit the spreadsheet follow, in sequence, the key strokes 1 through 10 listed below. (If the user wants to exit the spreadsheet and does not wish to save the work just performed, do only keystrokes 6 through 10 in



5-YR PROMOTION PLAN SECTION

COLONEL

	BOARD YEAR	YEAR GROUP	PROM CAP	LIST SIZE	LIST DURAT	YRS A F	.MOS C S
(ACTUAL)	FY 84	63	443	588	15	22	6
	FY 85	64	540	547	12	22	6
	FY 86	65	537	474	11	22	5
	FY 87	66	534	594	13	22	6
	FY 88	67	541	782	18	23	0
	FY 89	68	526	643	14	23	2
	TOTAL		3121	3628			

LIEUTENANT COLONEL

	BOARD YEAR	YEAR GROUP	PROM CAP	LIST SIZE	LIST DURAT	YRS A F	.MOS C S
(ACTUAL)	FY 84	69	1456	1927	15	17	0
	FY 85	70	1499	2093	15	17	3
	FY 86	71	1686	1602	12	17	3
	FY 87	72	1679	1406	10	17	1
	FY 88	73	1706	1373	9	16	10
	FY 89	74	1739	1420	10	16	8
	TOTAL		9765	9821			

MAJOR

	BOARD YEAR	YEAR GROUP	PROM CAP	LIST SIZE	LIST DURAT	YRS A F	.MOS C S
(ACTUAL)	FY 84	74	2257	1860	10	11	2
	FY 85	75	2273	1858	10	11	0
	FY 86	76	2342	2193	11	10	11
	FY 87	77	2315	2476	12	10	11
	FY 88	78	2309	2746	14	11	1
	FY 89	79	2312	2709	14	11	3
	TOTAL		13808	13842			

Figure 6.14 Monitor Display at the End of STEP 22.

sequence. Skip STEP 23 altogether and go STEP 24 if a hard copy of the promotion plan is desired. Likewise go to STEP 25 if the operator wants to use the "What if?" capabilities of the PRO_PLAN spreadsheet. Finally, go to STEP 26 for a demonstration of the graphics capabilities of LOTUS 1-2-3.)

1. "/", "Enter";
2. "F";
3. "S";
4. "1984PLAN","Enter";
5. "R";
6. "/", "Enter";
7. "Q", "Enter";
8. "Y", "Enter";
9. "E", "Enter"; and
10. "Y", "Enter".

STEP 24: How to Print a Hard Copy of the Promotion Plan.

The following key strokes will provide the user with a hard copy of the 5-Yr Promotion Plan Section. This section contains all the consolidated grade promotion data which is of interest.

First, scroll the monitor screen until cell U1 is in the upper left corner of the monitor screen. Next, perform the following six key strokes in the sequence given:

1. Press the "/" key;
2. Press the "P" key;
3. Press the "P" key;
4. Press the "R" key;
5. Now type "U1..AF37" and press the "Enter" key; and
6. Press the "G" key.

At this time the printer should be printing the range of cells which define the 5-Yr Promotion Plan Section of the spreadsheet. Once the printer stops, press the "ESC" key three times to clear the Command Choice menu from the top of the screen. (Any portion of the spreadsheet or even the entire spreadsheet may be printed using the LOTUS 1-2-3 commands found in the manufacturers operators manual.)

Return to STEP 23 and follow the instructions to exit the program if no further use of the spreasheet is desired.

STEP 25: "What if?" Capability Demonstration.

Now that the Five Year Promotion Plan is developed, hypothetical scenarios are easily generated by merely entering the hypothetical data into the appropriate cell in the User Input Section. For instance, "What if the COL losses were increased by 420 and LTC losses were increased by 330 during the promotion year 1986?" "How would the Five Year Promotion Plan be affected?" To answer that

question, first place the cursor in cell G4 and enter the number 845. (This is the old forecasted loss of 425 plus the hypothetical increase of 420.) Do the same with the hypothetical increase in LTC losses. Place the cursor in cell G10 and enter the number 1248 (918 + 330 = 1248). As soon as the numbers are entered, the spreadsheet recalculates all of the outputs and displays them as before. Now scroll to the 5-Yr Promotion Plan Section to view the answers to this "What If?" question. Put cell U1 in the top left corner of the monitor screen which should look like Figure 6.15. To exit the spreadsheet go back to STEP 23 and follow the instructions.

G10: (F0) U 1248 READY

	A	B	C	D	E	F	G	H	I
1	USER INPUT SECTION								
2	ENTER PC DATA HERE:		PROM YR		85		86		87
3	COL VACANCIES:								
4	+ Losses =				559		845		487
5	+ Pro to BG =				50		50		50
6	+/- DOPMA =				-166		65		0
7	----------				-----		-----		-----
8	COL PC =				443		960		537
9	LTC VACANCIES:								
10	+ Losses =				890		1248		1149
11	+ Pro to COL =				443		960		537
12	+/- DOPMA =				123		41		0
13	----------				-----		-----		-----
14	LTC PC =				1456		2249		1686
15	MAJ VACANCIES:								
16	+ Losses =				641		628		656
17	+ Pro to LTC =				1456		2249		1686
18	+/- DOPMA =				160		146		0
19	----------				-----		-----		-----
20	MAJ PC =				2257		3023		2342

Figure 6.15 Monitor Display after Entry of "What if?" Data..

STEP 26: How to Generate a Graph.

The graphics capability of LOTUS 1-2-3 is one of its most appealing features. The following key strokes are only to demonstrate one way of graphically displaying outputs of interest from the 5-Yr Promotion Plan Section. There are

numerous combinations and options to choose from when constructing a graph using LOTUS 1-2-3.

For demonstration purposes we will construct a bar graph which depicts the change in list duration from one year group to the next for the grade of colonel. Perform the following list of commands, 1 through 32, in the sequence given:

1. "/";
2. "G";
3. "R";
4. "G";
5. "T";
6. "B";
7. "X";
8. "Y5..Y10", "Enter";
9. "A";
10. "AB5..AB10", "Enter";
11. "O";
12. "T";
13. "F";
14. "Colonel List Duration", "Enter";
15. "T";
16. "X";
17. "Year Group", "Enter";
18. "T";
19. "Y";
20. "Months Duration", "Enter";
21. "S";
22. "Y";
23. "M";
24. "U";
25. "24", "Enter";
26. "Q";
27. "Q";
28. "N";
29. "C";
30. "COL_LIST", "Enter";
31. "V";
32. "Enter".

To get a hard copy of the graph just created enter the following keystroke sequence 1 through 16:

1. "S";
2. "COL_LIST","Enter";
3. "Q";
9. "S";
10. Put cursor on "COL_LIST", "Enter";
11. "G";

4. "/";
5. "Q";
6. "Y";
7. "P";
8. Insert the LOTUS 1-2-3 Print Graph disk into drive A and press "Enter";
12. When printer stops, press "Q";
13. "Y";
14. "E";
15. "Y";
16. Remove the Print Graph disk.

If no mistakes were made the graph should look similar to Figure 6.16.

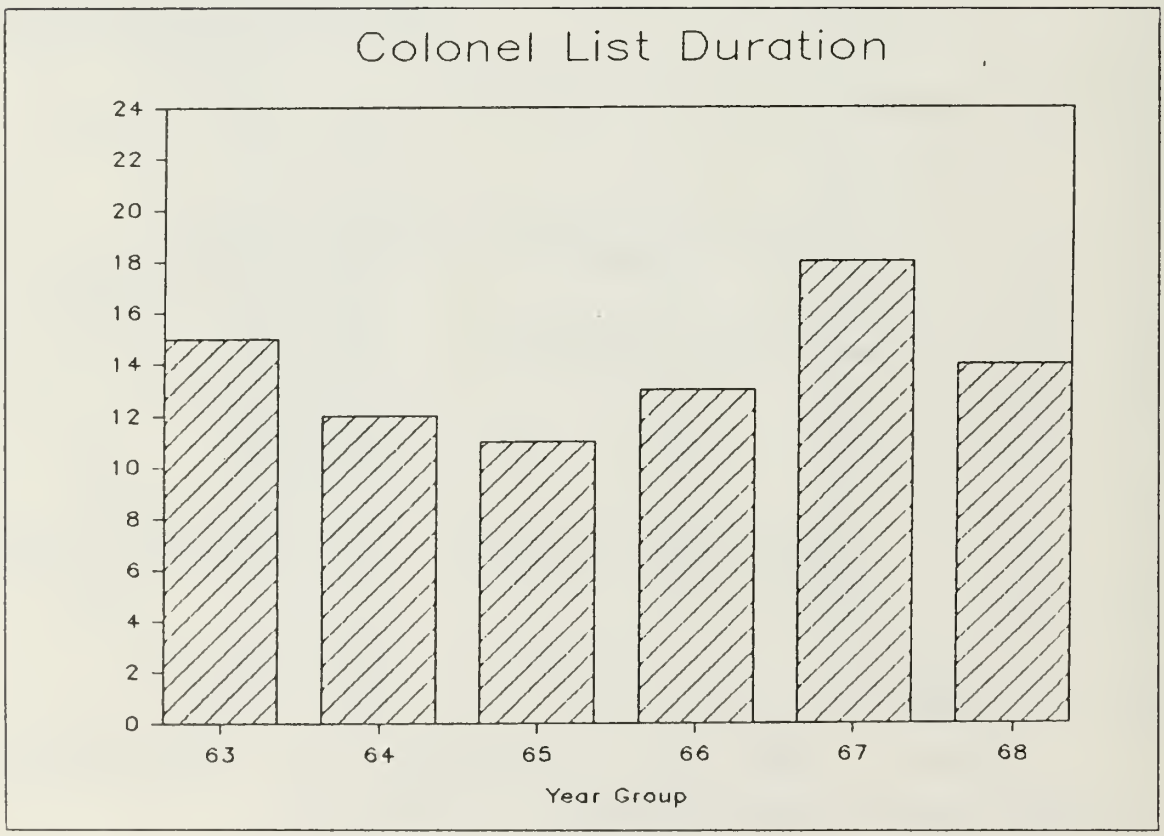


Figure 6.16 Demonstration Graph.

This concludes the demonstration on how the spreadsheet is operated. Return to STEP 23 for instructions on how to exit the program. LOTUS 1-2-3 has capabilities far beyond those demonstrated in this thesis and the user should consult the operator's manual to fully exploit the advantages LOTUS 1-2-3 provides.

VII. CONCLUSIONS

The preceding chapters documented the mathematical logic used to produce the US Army Five Year Field Grade Officer Promotion Plan. The conclusions from this thesis revolve around the quantum differences between the manual production of the Five Year Promotion Plan and the use of microcomputer technology to produce the same promotion plan. This thesis did not, nor was it intended to, question the mathematical logic used currently by the force planners at MILPERCEN. The thesis did document the logic used and applied that same logic to produce the promotion plan using microcomputers and the commercially available software package, LOTUS 1-2-3. The conclusions one draws when comparing the manual process to the automated process are clearly significant and persuasive. Microcomputers and commercial software programs are powerful tools which can drastically increase the productivity of force planners and personnel managers at all levels. These tools will reshape the way problems are forecasted, alternatives developed, solutions analyzed, programs implemented and feedback processed to optimize the outcomes. The application of this technology in the force planning arena is bounded only by the imagination of the force planners themselves.

This thesis has clearly demonstrated significant advantages of applying the commercially available state-of-the-art computer software package, LOTUS 1-2-3, to producing the Five Year Promotion Plan. The more obvious advantages are:

1. The time savings alone justifies the use of microcomputers to produce the Five Year Promotion Plan. The production of the promotion plan is comprised of hundreds of

mathematical computations. Though each one of these is mathematically simplistic, the sheer number of these computations is overwhelming. Currently it takes two or three working days for one individual to develop the Five Year Promotion Plan manually. Using the electronic spreadsheet, the plan can be produced in less than 15 minutes, the time it takes to enter the data from scratch provided the microcomputer is available, assembled and connected. Once the original promotion plan is computed, updates and changes are executed in a matter of seconds with the microcomputer, whereas, manually the response time is in hours or days.

2. The reliability of the automated Five Year Promotion Plan is absolute once the logic has been checked out, while the reliability of the manual version is dependent on checks each time new calculations are made. The manual technique is laborious in nature, repetitive in its procedures and prone to human error. All errors made are carried forward to subsequent calculations and are compounded throughout the final product. Errors such as inconsistent rounding of fractions and arithmetic mistakes are characteristic of any manually based procedure. Electronic spreadsheets do not make these type mistakes. The primary caution needed to generate reliable answers when using a microcomputer rests in entering the data. Even in this regard the automated version has advantages. The protections built into the spreadsheet software often signal the user an error has been made. As a result entry errors are easier to guard against and more readily detected than the errors inherent with a manual procedure. As long as the operator enters the given data correctly the microcomputer will correctly perform the programed mathematical logic and produce reliable answers.

3. Electronic spreadsheet technology is a forceful agent of decentralization [Ref. 12]. within the force

planning work area. Access to a desk top microcomputer, LOTUS 1-2-3 and the Five Year Promotion Plan Spreadsheet is all that is needed to produce the promotion plan. No doubt the mathematical logic could be programmed into a mainframe computer. However, access to a centralized computing system is often a limiting factor. Using microcomputers presents the decentralized capability that gives numerous force planning personnel the capability to produce the promotion plan quickly and easily. The manual process dictates a reliance on one or two individuals who must thoroughly understand the mathematical logic to produce the promotion plan. Also these individuals must be prepared to dedicate the requisite time needed to accomplish the painstaking effort.

4. One of the greatest advantages the electronic spreadsheet tool provides the force planner is the "What if?" capability. Force planners are free to explore hypothetical developments and experiment with various scenarios while instantly seeing the forecasted results. The manual system naturally reinforces a reluctance to generate different alternatives. The time lag needed to generate the results of different promotion scenarios and a reluctance to dedicate the personnel necessary to "run the numbers" can often prevent options from being explored. The availability of the electronic spreadsheet should create a whole new mental attitude toward preparing projections and, as a result, create additional alternative solutions to force planning issues. Electronic spreadsheet technology should encourage force planners to approach their work more imaginatively. [Ref. 13]

5. Frequent updates of the Five Year Promotion Plan are vastly more appealing. The availability of microcomputers and the Five Year Promotion Plan Spreadsheet encourages force planners to keep track of information that was

previously too time consuming to be bothered with on a daily basis. Actual promotion data can be fed into the spreadsheet on a daily basis so that force planners can immediately recognize and track developing trends. It is likely that this spreadsheet production of the Promotion Plan will encourage new imaginative uses of the Plan.

Although this thesis documented the logic used to produce the Five Year Promotion Plan for the competitive category "Army" this same spreadsheet is applicable to any of the eight other categories. Productivity increases are unavoidable when readily available modern technology is put to work. This thesis has hopefully demonstrated this fact beyond all reasonable doubt.

APPENDIX A
GLOSSARY

ABOVE THE ZONE (AZ): A promotion eligibility category of the zone of consideration which consists of commissioned officers on the active duty list of the same grade and competitive category, eligible for promotion consideration and whose date of rank is senior to any officer in the promotion zone.(AR 624-100)

ABOVE ZONE CONSIDERED (AZ Cons): The actual or forecasted number of officers considered by the promotion board who are in the above zone, AZ.

ABOVE ZONE SELECTED (AZ Sel): The actual or forecasted number of officers selected for promotion from the above zone, AZ.

ACTIVE DUTY LIST (ADL): An order of seniority list (required by 10 USC 620) of commissioned officers on active duty in the US Army other than those listed below (10 USC 641).

a. Reserve officers.
b. The Director of Admissions, Dean and permanent professors at the United States Military Academy
c. Retired officers on active duty.
d. Students at the Uniformed Services University of the Health Sciences.(AR 624-100)

ACTIVE FEDERAL COMMISSIONED SERVICE (AFCS): Usually measured in terms of years and represents the time an officer has spent on active duty as a commissioned officer.

BELOW THE ZONE (BZ): A promotion eligibility category of the zone of consideration which consists of commissioned officers on the active duty list of the same grade and competitive category, eligible for promotion consideration

and whose date of rank is junior to any officer in the promotion zone.(AR 624-100)

BELOW ZONE CONSIDERED (BZ Cons): The actual or forecasted number of officers considered by the promotion board who are in the below zone, BZ.

BELOW ZONE SELECTED (BZ Sel): The actual or forecasted number of officers selected for promotion from the below zone, BZ.

CAN PROMOTE (CP): The number of vacancies filled, by officers on the most recent promotion list, during a promotion year. It is determined by subtracting the number of officers remaining on any previous list(s) from the promotion capability for that promotion year.

COMPETITIVE CATEGORY: A group of commissioned officers who compete among themselves for promotion and, if selected, are promoted in rank order as additional officers in the higher grade are needed in the competitive category. Competitive categories are listed below.

a. Army. (Includes officers in specialties 00 through 54 and 69 through 97.)
b. Army Nurse Corps
c. Medical Service Corps
d. Veterinary Corps
e. Army Medical Specialist Corps (combined with Medical Corps for promotion above the grade of colonel)
f. Medical Corps
g. Dental Corps
h. Judge Advocate General's Corps
i. Chaplains Corps (AR 624-100)

DATE OF RANK (DOR): The date on which an officer actually or constructively was appointed in a particular grade. This date is used to determine the relative seniority of officers holding the same grade. (AR 624-100)

DUE COURSE OFFICER: An officer who has never failed to be selected for promotion from the in zone (IZ) when first considered and who has never been selected from the below zone (BZ) to any grade.

FAILED SELECTION FOR PROMOTION: An officer below the grade of colonel in or above the promotion zone who is considered and not recommended for promotion by

a. a Department of the Army (DA) promotion selection board, or

b. a DA special selection or a DA promotion advisory board considering an officer who was not considered by an appropriate DA promotion selection board. (AR 624-100)

GRADE: A step or degree, in a graduated scale of office or military rank, that is established and designated as a grade by law or regulation. (AR 624-100)

IN ZONE CONSIDERED (IZ Cons): The actual or forecasted number of officers considered by the promotion board who are in the promotion zone, IZ.

IN ZONE SELECTED (IZ Sel): The actual or forecasted number of officers selected for promotion from the in zone, IZ.

LIST DURATION: The elapsed time from the date the most senior officer on a specific promotion list gets promoted to the date the most junior officer on the promotion list gets promoted. List duration is normally expressed in months.

LIST EXPIRATION: The calendar date the last (most junior) officer on a promotion list gets promoted.

OFFICER: A commissioned officer unless otherwise specified. (AR 624-100)

PREVIOUS LIST (PL): The number of officers on an approved promotion list who must be carried over to the following fiscal year and await vacancies to occur before being promoted.

PROMOTION BOARD: A centralized promotion process by which a group of senior Army officers are tasked to review the records of officers being considered for promotion and select a number of those officers to be recommended for promotion.

PROMOTION CAPABILITY (PC): The number of actual or forecasted officer vacancies which will occur during a promotion year.

PROMOTION LIST: A list of officers, by competitive category, recommended and approved for promotion. (AR 624-100)

PROMOTION RATE PER MONTH IN A FISCAL YEAR (PR): The average number of promotions each month during a fiscal year. It is assumed to be constant throughout a specific fiscal year.

PROMOTION SEQUENCE NUMBER: A number which shows the rank order of officers on a promotion list. (AR 624-100)

PROMOTION ZONE: An eligibility category (defined ay an announced range of DOR) of the zone of consideration which consists of commissioned officers on the active duty list of the same grade and competitive category, who

a. for lieutenant colonels or below, are eligible for promotion consideration for the first time (excluding any below the zone consideration);
b. for colonels and brigadier generals, are eligible for promotion consideration, and have neither
   (1) not been recommended for promotion to the next higher grade when considered in the promotion zone, nor
   (2) been removed from a previous list of officers recommended for promotion to such grade. (AR 624-100)

RANK: The order of precedence among members of the Armed Forces. (AR 624-100)

SELECTED FOR PROMOTION: An officer recommended for promotion by a DA promotion selection board, DA special selection board, or DA promotion advisory board and approved by proper authority. (AR 624-100)

SEPARATION: Discharge, release from active duty, or retirement. (AR 624-100)

TOTAL SELECTED (Total Sel): The total number of officers selected for promotion from the three zones of consideration.

YEAR GROUP (YG): A cohort of newly commissioned officers who enter active duty within the same fiscal year.

ZONE OF CONSIDERATION: Commissioned officers on the active duty list of the same grade and competitive category whose dates of rank fall within a promotion eligibility category. The zone of consideration consists of the promotion zone, above the zone, and below the zone. (AR 624-100)

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